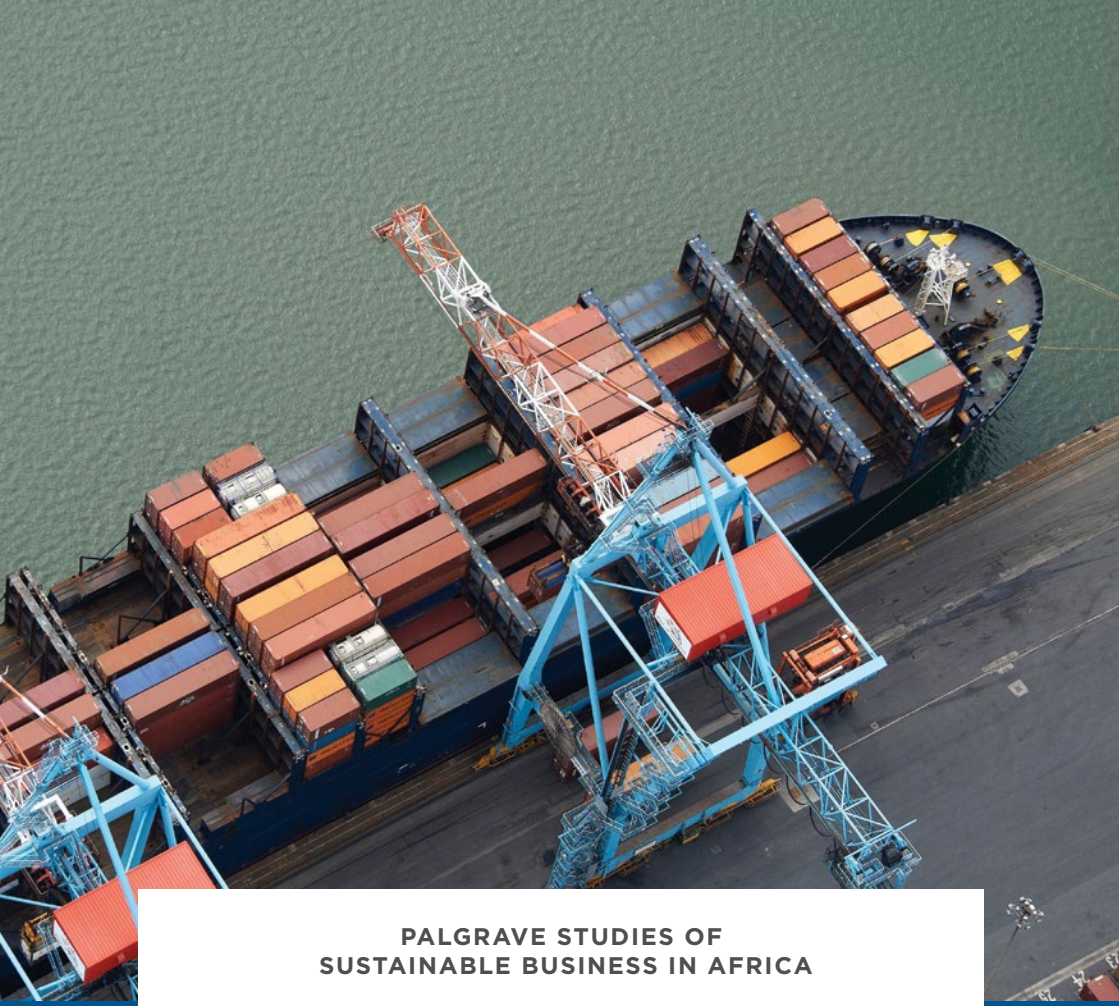

PALGRAVE STUDIES OF
SUSTAINABLE BUSINESS IN AFRICA

LOGISTICS AND GLOBAL VALUE CHAINS IN AFRICA

THE IMPACT ON TRADE AND DEVELOPMENT

EDITED BY
ADEBISI ADEWOLE
JOHN J. STRUTHERS

Palgrave Studies of Sustainable Business in Africa

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Brighton, UK

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Editors

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William Davis is an economist working with the Economic Commission for Africa of the United Nations on financing for development. From 2013 to 2017, he worked for the commission's African Trade Policy Centre on trade in services, inter alia, and had a number of assignments prior to that, including from 2009 to 2011 for Her Majesty's Treasury in the UK on financial and legal services policy. He holds an MPhil in economics from Oxford University.

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Samuel K. Gayi Until his retirement in June 2017, Samuel K. Gayi was director and head of the Special Unit on Commodities (SUC) at UNCTAD, Geneva. Previously, he was principal planning economist and acting manager of the African Development Bank in Côte d'Ivoire. He has spent many years teaching and researching, and has published on a wide range of development issues, including trade diversification, structural adjustment and poverty, commodity dependence, financial sector reforms and domestic financial resources mobilisation. He co-ordinated and contributed to three UNCTAD flagship publications, including *The Least Developed Countries Report* (1995–1999) and the *Economic Development in Africa Series* (2003–2008). On becoming head of the SUC in 2011, he introduced and co-ordinated the production of a new biennial UNCTAD report: *Commodities and Development* (2013–2017). Under Gayi's leadership, UNCTAD's Global Commodities Forum, a high-level multi-stakeholder platform on commodities and development, provided an opportunity for deeper examination of equity and other issues facing countries heavily reliant on trade in major commodities. He was a member of the Senior Steering Group of the UN Secretary General's High Level Task Force on the Global Food Security Crisis. He also co-ordinated UNCTAD's participation in the UN Secretary General's Zero Hunger Challenge. Gayi holds a PhD in development

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Part I

Logistics and Supply Chain Strategy

1

Trade and Economic Development in Africa: The Interaction Between Logistics and Global Value Chains

Adebisi Adewole and John J. Struthers

1.1 Overview and Structure of the Book

This book provides a comprehensive explanation of the relevance of logistics and global value chains (GVCs) to trade on the African continent. It takes the reader through a structured but logical development of knowledge relating to these issues, backed up by extensive coverage of recent trends in African trade. A strength of the book is that the sections build on each other, thus it can be read on a section-by-section basis. Readers are assisted by pertinent and up-to-date references on the many different topics covered.

With the development and advancement of integrated logistics and supply chain frameworks and the untapped potential for trade in Africa, there is a need for a critical appraisal of the significant roles of

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logistics and GVCs and the relationships between the two concepts. This book sets out to examine how the demand and supply dimensions of supply chain architecture interact with the economic concepts of GVC. This inter-connectedness between supply chains/logistics and global value chains is conceptually critical to ensure a clear understanding of: long-term sustainability of supplier–customer relationships; environmental accountability; social responsibility; and the economic viability of actors within GVCs. These four elements are closely bound together and are reflected in each of the chapters that follow.

It is the authors' contention that this book will fill a significant gap in the trade literature on Africa by combining these two related but distinct areas of study. In so doing, the authors hope that justice will be done to the complexity of these intertwined aspects of trade in order that progress can be made on the African continent to achieve viable and sustainable supply chain/logistics along with equitable and efficient GVCs. Moreover, this can also contribute to a more collaborative multi-stakeholder approach that can help to bring about much-needed fair and more competitive trade deals for Africa.

1.2 Key Concepts in Logistics and Supply Chains

1.2.1 Logistics

The word "logistics" originated from the military lexicon during the Second World War when the allied forces employed logistics skills to try and win the war. Since the end of the First World War, business organisations have adopted similar logistics management skills to create competitive advantages. There have been varying views with regard to what logistics truly means. While some see logistics as having mainly to do with the application of mathematics in military concerns, others (particularly in the latter part of the twentieth century when the term

crept into the non-military, commercial lexicon) regard it as a source of competitive advantage for business organisations.

The UK's Chartered Institute of Logistics and Transport (CILT 2018) described logistics as the time related positioning of resources to meet user requirement, and this involves getting the right products to the right place in the right quantity at the right time in the right conditions at the right costs; whilst the US-based Council of Supply Chain Management Professionals (CSCMP) suggests logistics to be "the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements. This definition includes inbound, outbound, internal, and external movements" (CSMP 2013).

These definitions suggest that logistics functions comprise processes and activities such as transport, warehousing, forecasting, order processing route design and customer services among others, which entail the movement of goods from point of origin to the point of use.

1.2.2 Supply Chain Management

The term "supply chain management" (SCM) was first conceptualised by consultants in the mid-1980s and has since gained considerable recognition from academics and business managers. The concept of SCM is wider than logistics and is derived from the idea of a network of processes linked together to form a web or a loop. SCM represents the management of a much broader inter-organisational relationship across the upstream (supplier end of the chain) and the downstream (customer end of the supply chain) echelons.

Christopher (2016) defines SCM as "the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole". He noted that the focus of SCM is on co-operation and trust and the recognition that, properly managed, the whole can be greater than the sum of its parts.

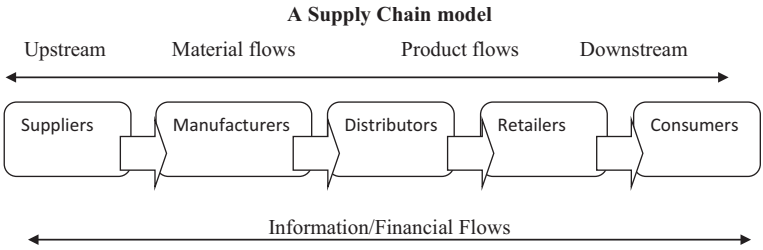

Fig. 1.1 A supply model. (Source: Model developed by author from the literature)

The supply chain comprises the flow of all information, products, materials and funds between the different stages of creating and selling a product. A company's supply chain represents every step in the process, starting from creating an idea for a good or service, designing and manufacturing the product, transporting it to a place of sale and then to selling it. In essence, the supply chain concept includes the management of all functions from initial idea to delivery (Fig. 1.1).

1.3 Global Value Chains

The idea of value chain was pioneered by Porter (1985). The five steps in the value chain give a company the ability to create value that exceeds the cost of providing the good or service to customers. Maximising the activities in any one of the five steps allows a company to have a competitive advantage over competitors in its industry. The five steps or activities are: inbound logistics; operations; outbound logistics; marketing and sales; and service. Inbound logistics include receiving, warehousing and inventory control. Operations include value-creating activities that transform inputs into products. Outbound logistics include activities required to get a finished product to a customer. Marketing and sales are activities associated with getting a buyer to purchase a product. Service activities include those that maintain and enhance a product's value, such as customer support.

The difference between a value chain and a supply chain therefore is that a supply chain is the process of co-ordinating all parties involved in fulfilling a customer requirement, while a value chain is a set of inter-

related activities that a company uses to create a competitive advantage. Fredrick (2016) described the value chain as "the full range of activities that firms and workers do to bring a product from its conception to its end use and beyond". This includes activities such as design, production, marketing, distribution and support to the final consumer. The activities that comprise a value chain can be contained within a single firm or divided among different firms. Value chain activities can produce goods or services and can be contained within a single geographical location or spread over wider areas. In the context of developing countries, especially in Africa and in relation to commodities trading, the concept of value chain has expanded to include a stream of activities in GVC networks that comprise "the full range of economic activities that are required to bring a product from its conception, through its design, its sourced raw materials and intermediate inputs, its marketing, its distribution and its support to the final consumer" (Kaplinsky and Moris 2001). Simply put, a GVC includes all of the people and activities involved in the production of a good or service and its supply and distribution activities at the global level. A GVC is therefore similar to an industry-level value chain but encompasses operations at the global level.

GVCs also have another dimension that relates to the extraction of surplus or "rents" at different stages of the production, distribution, marketing and selling stages of the cycle. A number of authors, such as Gereffi and Korzeniewicz (1994), Fitter and Kaplinsky (2001) and Ponte (2002), have written seminal work on GVCs, which has been built upon by others since the turn of the century. International organisations such as UNCTAD (2013) and the Keane and Baimbill-Johnson (2017) have also focused on the role of GVC upgrading on the part of primary commodity producing countries as an essential requirement for them to benefit fully from world trade. A key point made in all of these studies is that every commodity (or material) has its own "bespoke" GVC, which is unique to that commodity. So, while the overall structure of a value chain may have common elements, they are all commodity specific. Even within commodity groupings, there are differences. For instance, within the "soft" tropical beverages group, the GVC for tea will be different from the GVC for coffee, and the GVC for coffee will be different from the GVC for cocoa. Similarly within the "hard" commodities group, the GVC for copper will be different from the GVC for iron ore, and so on.

1.4 Chapter Summaries

1.4.1 Part I

Chapter 1 is the introduction. The chapter discusses the relationships between logistics and SCM and GVC in relation to their contributions to, and facilitation of, trade and economic development in Africa. The chapter presents the reader with an overview of the contents and structure of the book.

Chapter 2 provides a general view of the dynamics of logistics infrastructure and its impact on trade and development in Africa. Adewole takes the view that despite Africa rapidly emerging as a strategic trade bloc with a growing wealth, the continent's inadequate infrastructural landscape is holding back trade and economic development. The author discusses the critical challenges facing logistics infrastructure in Africa, particularly in modes of freight movement, such as rail, road, sea and air transport. Adewole attributes the slow pace of logistics infrastructure development in Africa to: inadequate inland roads and railways; the high cost of operations; the lack of adoption of new technology; bureaucratic and inefficient port management; the absence of a defined strategy for freight transport; inadequate investment; ineffective regional collaborations; and a lack of political will. Despite these limitations, the chapter outlines some recent and on-going advances in trans-African highway development projects assisted by the African Development Bank and the United Nations Economic Development in Africa. He recommends better transport infrastructure with more connectivity across borders; a collective approach to an improved and more efficient intra-African transnational transport and logistics system; as well as the elimination of red tape bureaucracy and bottlenecks; and a common regulatory policy for freight logistics and transport in Africa.

In Chap. 3, Bvepfepfe outlines the concept of supply chains in the context of developing markets. He evaluates the key features of contemporary supply chains and provides an in-depth analysis of the attributes of SCM networks. The author explores the key organisational challenges facing supply chain managers generally and for businesses

operating in sub-Saharan Africa in particular. Topics covered in the chapter include: the nature of SCM, supply chain optimisation and performance improvement, collaboration in supply chain operations, supply chain risk management and sustainability of supply chain operations. The author discusses each topic within a global context, viewing the sub-Saharan region from an economic development perspective. The chapter draws on primary and secondary data with supporting graphics, providing insights into the systems and network infrastructure. Bvepfepfe considers rail freight to be the more sustainable mode of transportation because of its capacity to carry large volumes of cargo over long distances and with fewer carbon emissions. The author suggests that in their supply chain operations, logistics network service providers and shippers in Africa should consider inter-modal freighting to reduce costs. The chapter concludes that sustainable logistics and supply chain operations are essential for economic growth and development in Africa.

In Chap. 4, Burl sets out a critical review of road freight transport in sub-Saharan Africa. He argues that Africa south of the Sahara has the least developed road transport infrastructure compared with the rest of the world. The chapter outlines some key freight transport challenges hindering trade and economic development in the continent including: poor intra-regional road networks; the high cost of road freight movement; overloaded vehicles; under-utilised vehicles; and the use of older vehicles as well as poorly trained vehicle operators. The chapter argues that due to geopolitical and socio-cultural problems, sub-Saharan Africa is yet to experience the global economic gains enjoyed by other regions of the world. The author suggests that the absence of a paved road network is a major contributor to Africa's retarded economic development. The chapter suggests that the adoption of inter-modal freight containerisation and the deployment of better road freight vehicles that are adapted to the terrain could partially overcome the problem of low-quality transport infrastructure. The chapter concludes that significant improvement in road freight transport technology is achievable and could result in much enhanced regional trade and economic improvement.

1.4.2 Part II

The fifth chapter, by Struthers, covers the range and scope of research on commodities since the 1970s, particularly in relation to African producers, and how that research has helped academics to analyse this important topic within African trade and development. The chapter focuses on the Commodity Dependent Developing Countries (CDDCs), which are defined as those countries where at least 60% of their overall export earnings come from these (mainly) primary commodities. Topics covered include: the rise and fall of International Commodity Agreements; the effects of market liberalisation on commodity markets during the late 1980s and early 1990s; the impact of commodity price volatility and possible commodity "super-cycles", especially after the 2007–08 global financial crisis, and the resultant "financialisation" of commodity markets; the emergence of market-based price risk management instruments such as commodity futures and options, which have been developed to help CDDCs mitigate such risk; and the development of commodity exchanges in a number of CDDCs including some in Africa, such as the Ethiopian Commodity Exchange. Finally, the chapter concludes with a discussion on the means whereby more and more of these CDDCs can participate in commodity GVCs in order to extract greater value from the very commodities that they produce. In so doing, the chapter also highlights the crucial role played by smallholders in the countries that produce these commodities, which serves both as a reminder of the constraints that many CDDCs face in securing these gains, but also the urgent need to continue attempting to do so, not least in terms of securing the livelihoods of such smallholders. This chapter also provides a bridge between the first section of the book, which has an emphasis on logistics and SCM concepts, and the second half of the book, which focuses much more on the crucial role of GVCs within the context of African trade.

Chapter 6, by Banini and Gayi, has the thought-provoking title "Does Africa have what it takes to upgrade in global value chains?" After setting out recent trends in international trade and how these have benefited many African countries, the chapter outlines the growing challenges faced by many African countries in the face of rapid globalisation. Partly due to the fact that these GVCs, especially in manufacturing and services,

have become geographically spread around the world, many CDDCs remain at a severe disadvantage in terms of the upgrading process that will be required on their part to benefit from the GVC process. Given the many structural constraints faced by a number of African countries, the chapter argues that appropriate development policies will be required to achieve this objective, even partially. A bright spot highlighted in the chapter, which might at least support the aim for regional value chains to emerge within the process, is the potential offered by increased intra-African trade. Improved intra-African trade has been a desire of many African leaders for many decades and is the basis for the multiplicity of regional trade agreements such as COMESA, SADC, EAC and ECOWAS that operate across the continent.[1] Progress is hampered by a combination of physical and infrastructural bottlenecks (e.g., costly and laborious border procedures and poor transportation facilities); high trade costs caused by a plethora of non-tariff barriers and non-tariff measures; and the lack of opportunities for genuine product differentiation. According to the authors, only with genuine reform of institutions, structural change and a possible enhanced role for the private sector, will such upgrading along the GVCs be possible.

Chapter 7, by Keane, follows on from Banini and Gayi by suggesting that the possibility of future "fragmentation" in GVCs—that is, the creation of "regional clusters" in the production of goods and services around the world (Factory South, Factory US, Factory Europe, Factory Asia)—will put additional pressure on small firms (and producers) especially in the developing world. This will lead to a "very different global trading landscape" according to Keane. The author also argues, and this resonates with the main purpose of this book, that the role of logistics capability per se, and the potential to service multiple markets will be a crucial, possibly decisive, component of future GVCs. Where does this leave developing countries, particularly in Africa? Keane tries to address this question, at least partially, by highlighting the case of the cut flower sectors in Kenya and Ethiopia. Both countries have managed this transition, albeit in these limited sectors, by progressing from simply supplying the commodity at the lowest end (or tier), within the appropriate GVC, to delivery to the final markets. This has been achieved in these two countries because investors in Kenya commenced production in this activity

in Ethiopia, which is a lower-cost producer than Kenya. Ethiopia's participation in this GVC has been facilitated by foreign direct investment (FDI) linking the supply of cut flowers to Dutch auction houses. This is known as the "flying geese" phenomenon, with the logistics carried out by Kenyan companies. With increased intra-African trade and the involvement of FDI, including intra-African FDI, there is no reason why this cannot be replicated over time in other African countries.

The chapter by Pesce, Tumuhimbise, Davis and Sommer on the importance of the services sector for Africa adopts an innovative approach to a neglected part of the economy, at least as far as the African continent is concerned. Improving the continent's services sector is also highlighted in Chap. 5, by Banini and Gayi, who urge Africa to move from low value services to high value services. Starting with an overview of recent trends in services provision in less developed countries, including many in Africa, the authors measure the value-added effects of the services sector. This is done at the aggregate level as well as at the subsector level. The authors also focus on a number of specific countries, such as Ethiopia, Liberia, Equatorial Guinea and Nigeria, which have all, over recent years, seen substantial growth in the contribution of the services sector to their gross domestic product (GDP). In Nigeria, for example, this has been particularly true of the telecommunications and ICT sector that, according to the authors, contributed 10.4% of the country's growth over the period 2010 to 2013. Additional by-products of growth in the services sector in Africa are that it not only attracts inward investment (FDI), it can also contribute positively to achieving the Sustainable Development Goals (SDGs) including improved infrastructure, greater financial inclusion, and skills development among Africa's population.

Chapter 9, by Eba and Struthers, approaches the issue of commodity price volatility in Africa from the perspective of the various market reforms and institutions set up to stabilise commodity prices or, at least, to stabilise the income received by the farmers and producers of these commodities. The impact of these reforms on participation in agricultural supply chains is discussed in general. This is followed by a detailed discussion of the impact of market reforms in three African countries and their respective commodities: Ivory Coast (coffee and cocoa); Ghana

(cocoa) and Burkina Faso (cotton). The chapter then proceeds to discuss the impact of the market reforms from a principal–agent perspective. The creation of local commodity exchanges, such as that in Ethiopia, as a means of mitigating the effects of commodity price volatility, is then analysed. It has been suggested by some authors (Struthers 2017) that the setting up of a commodity exchange can not only mitigate some of the principal–agent problems that often beset commodity production but also reduce the potential transaction costs, improve price discovery on the part of commodity producers and give them greater access to well-structured foreign markets. This chapter also highlights the problems that producers, especially smallholder farmers, have in fully engaging with GVCs for their commodities. The chapter concludes by suggesting that the creation of successful commodity exchanges can complement the market reforms that have been carried out in many African countries. Moreover, some statistical evidence is provided to suggest that such innovations can not only reduce transaction costs but also increase value-added to the farmers and producers by reducing the number of middlemen/intermediaries within the supply chain.

The final chapter of the book, by Isah Dara, presents the findings of an empirical econometric study of a number of African countries in terms of the links between human development (using the UN's human development index (HDI)) and trade openness. The HDI is a composite index that measures human development in relation to aspects such as healthcare and life expectancy; education levels; and standard of living, along with other parameters. Improving these aspects of human development in Africa is of course a top priority, not least to assist the poorest members of society to improve their life chances. It can also lead to stronger economies based on more effective engagement of these countries with GVCs and trade generally. Improvement in human development (human capital, knowledge, skills and capacity) are a sine qua non in this context. The chapter provides strong support econometrically for a link between trade openness and human development for the countries covered in the empirical analysis (Chad, Democratic Republic of Congo, Central African Republic, Niger, and Sierra Leone over a 30-year period) and outlines some key policy requirements for governments to implement (Fig. 1.2).

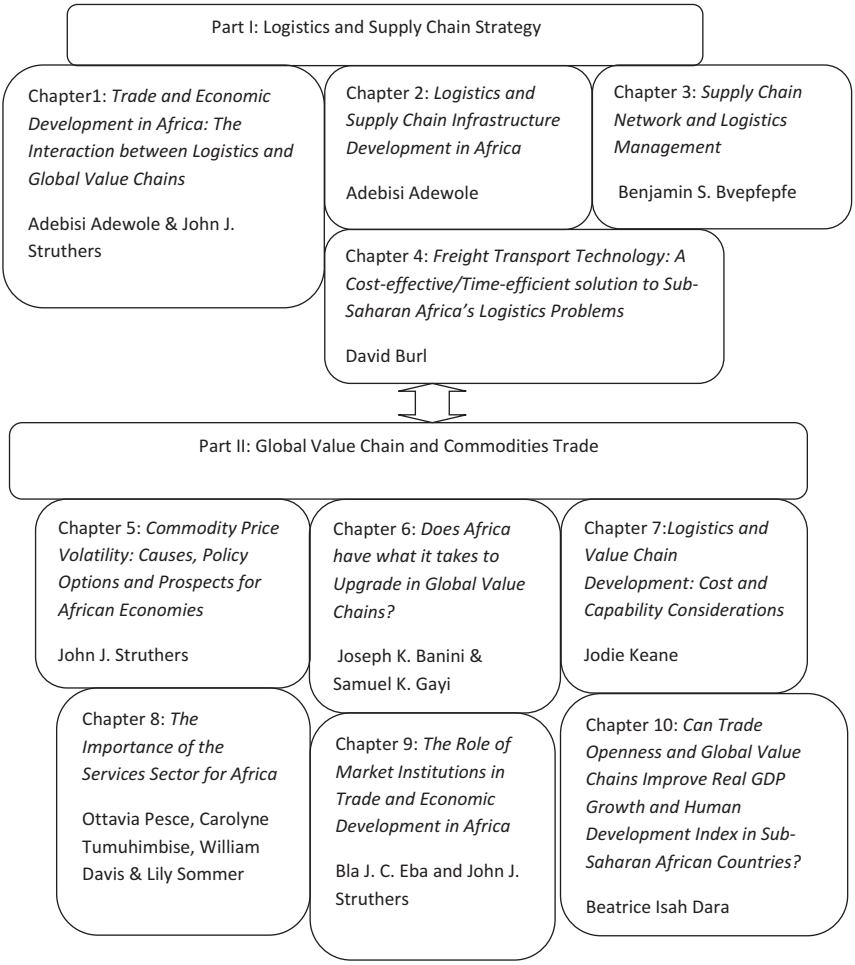

Fig. 1.2 Diagram showing structure of chapters. (Source: Developed by author)

Notes

1. COMESA is the Common Market for Eastern and Southern Africa; SADC is the Southern Africa Development Community; EAC is the East African Community; and ECOWAS is the Economic Community of West African States.

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2

Logistics and Supply Chain Infrastructure Development in Africa

Adebisi Adewole

2.1 Introduction

The impact of global logistics and supply chain strategy has generated intense debate in both the academic sector and industry. But the significance of trade logistics infrastructure as a prerequisite for easier and better movement of goods and services in twenty-first-century Africa has attracted little attention. Business analysts and researchers (Fosu 2018; Brigsten 2018; Thorbecke and Ougang 2018) on Africa agree that Africa's economies are growing as the continent emerges as a strategic trading bloc with a growing wealth and urban-centric population. There are, however, growing concerns that poor logistical freight infrastructure, such as road and rail networks, air and seaports, as well as inadequate modern technologies pose difficult challenges to trade within Africa and between Africa and the rest of world.

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Suitable logistics infrastructure is a critical element of the fundamentals that make trading with Africa a priority for multi-nationals. A World Bank report (World Investment Report 2013) indicated that between 2006 and 2009, annual private capital inflows to Africa rose from around USD 30 billion to more than USD 80 billion. However, according to the report, the challenge remains that an increase in both intra-African and inter-continental trade with Africa has not translated into improved economies. Most African countries anchored their developmental economy on primary product exports, which, in the view of global value chain experts, are subject to price volatility arising from unfavourable terms of trade. The Human Right Development Report (2009) asserted that while many countries of the world have recorded steady improvements with regard to human development, many African countries suffered human development reversals from which they are yet to recover. This predicament is likely to be instrumental in the slow economic growth experienced in many African countries.

Chuhan Pole (2017) nevertheless reported Africa to have recorded some signs of impressive economic performances as the real per capita gross domestic product (GDP) continues to grow. His report stated that the continent is showing signs of recovery, and regional growth is projected to reach 2.6% in 2017, with growth expected to rise only slightly above population growth, a pace that hampers efforts to boost employment and reduce poverty. His report further noted that although recovery has been slow due to insufficient adjustment to low commodity prices and policy uncertainty in Africa, Nigeria, South Africa and Angola, the continent's largest economies have seen a rebound from the sharp slowdown in 2016.

The International Monetary Fund (IMF 2013) reported that growth in emerging markets including Africa will expand at an average of 6% a year from 2013 to 2018, far outpacing projections for the USA, Europe and that of emerging Asia for the first time. Similarly, an IMF report forecast that in the next decade, Africa's growth will continue to rival that of Asia, outpacing other emerging regions such as Latin America, the Middle East and Eastern Europe. The report further stated that African economies in the next decade will expand more than twice as fast as those of the developed world and are therefore likely to offer the highest returns and best opportunities for investors, businesses and logistics services providers.

In 2013, the World Bank estimated that 49% of the continent's 250 million households had discretionary income and by the end of 2015 that figure rose to rise to 64% of 303 million households. This represents an increase of 86 million consuming households (McKinsey 2015) showing that Africa is fast becoming wealthier. With Africa's growing population and increasing wealth, as well as the significant size of its consuming middle class, it would mean that trade logistics will have a compelling role to play in Africa.

Chuhan Pole (2017) viewed that in this context, promoting public and private investment, notably in infrastructure, is a priority, as Africa experienced a slowdown in investment growth from nearly 8% in 2014 to 0.6% in 2015.

> With poverty rates still high, regaining the growth momentum is imperative. Growth needs to be more inclusive and will involve tackling the slowdown in investment and the high trade logistics that stand in the way of competitiveness. Chuhan Pole (2017)

He noted that the urgent implementation of reforms to improve institutions that foster private sector growth, develop local capital markets, improve infrastructure and strengthen domestic resource mobilisation are imperatives for economic growth and development in Africa.

Albert G. Zeufack, World Bank chief economist for the Africa Region further emphasised that as countries move towards fiscal adjustment, Africa needs to implement more reforms and establish the right conditions for investment so that the continent can achieve a more robust development and create a stable macroeconomic environment.

Africa is comprised of more than half of the fastest growing economies of the world with a growth rate of 6% in East and West Africa despite the not too impressive level of infrastructure in those regions. With 54 countries, each with its own unique opportunities and challenges, the continent has the potential to move fast. Africa has become a prime investment destination for many international companies, as well as for companies that are already trading within it to branch out to other countries in the continent. Of particular interest are those companies operating in the retail and energy industries.

Global logistics and supply chain activities are major facilitators of trade around the world, and the emergence of information and communication technologies and their influence on inter-continental trading has converged world trade to a village enterprise. Products and services that used to be far flung are now more readily available around the world. Logistics and logistical infrastructure have therefore become imperative for traders as macro-business environments become more competitive.

This chapter discusses the current state of logistics infrastructure in Africa and examines the need for a better, more dynamic logistics and supply chain infrastructure strategy for the continent.

2.2 Logistics and Supply Chain Management

The concept of logistics varies widely. It can, however, be succinctly described as a means of having the right thing of the right quality and quantity at the right place, at the right time. The key elements involve procurement and warehousing, maintenance and the distribution and movement of goods and services from point of origin to point of consumption. A logistics design process needs to take account of the requirements of inbound, outbound, internal and external movements as well as the return of materials for recycling and environmental purposes.

Supply chain activities are usually organised as flow-through processes across a network of organisations. It is the overall unified integrated management function that provides the co-ordination of all logistical activities, including the funding and functioning controls that help to ensure the entire supply pipeline meets performance requirements at a reasonable cost. Adewole (2003) defined supply chain network as "a group of inter-dependent companies collaborating together within a network of relationships to manage the movement of materials, part-finished and finished goods as well as services, including all transactions and shared information, along a customer-focused value system in order to realise superior benefits at a competitive cost". The main goal is to provide the support that ensures that all processes and activities, including logistics, information and financial flows are performed as designed and with maximum effectiveness (Fig. 2.1).

Fig. 2.1 A simplified linear logistics and supply chain structure from the source to the end consumer

2.3 Critical Issues in Logistics and of Supply Chains in Africa

Generally, logistics infrastructure appears to be poor in Africa particularly for freight transport such as road and rail, with only seaports improving in countries such as Nigeria, Ghana, Tanzania and Kenya. With the many critical challenges facing logistics infrastructure in Africa, it is crucial therefore that this sector should be given more attention as a component of Africa's trade and economic discourse. The ubiquitous infrastructure gap inhibiting intra-African and intercontinental trade with the rest of the world can be bridged if adequate attention is given to this sector. Africa currently presents unique but diverse challenges for logistics and supply chain operations. There are significant obstacles to logistical activities when trying to do business in Africa's markets. Primary among these are: inadequate rail capacity; poor inland road quality; political conflicts; insecurity of life and property; insufficient and ineffective regional collaborations; a high level of bureaucracy and poor decision-making processes; inadequate technology; corruption and crime; and, more important, cultural issues.

Other significant barriers identified by Schwab (2009) in the 2009 World Economic Forum (WEF) report have been associated with Africa's weak management processes, including bureaucratic customs agencies, poor port and transport arrangements and high transport costs, emanating from the continent's slow development speed in trade and transport technology. These organic inhibiting factors have constituted trade restrictions in many ways to both importers and exporters to and from Africa.

The WEF report also noted that a low ratio of roads per square kilometre with a scattered population and long distances between urban areas, as well as the landlocked nature of many African countries create natural

obstacles to competitiveness. The WEF crucially pointed out that inland transport costs are higher within Africa compared to other regions. African landlocked countries pay close to one-third more in inland transport costs than landlocked countries outside Africa. The report went further, estimating the average cost of importing a typical container of goods into Africa to be USD 1100, while exporting a similar container from Africa only costs USD 872. This is higher than all other regions except for Eastern Europe and Central Asia. In addition, the report stated that Africa has the highest average port costs and terminal handling fees for imports and exports.

Another major factor militating against Africa's logistics and transport systems is the high level of unpredictability in delivery times, thereby forcing companies to hold higher volumes of inventory than elsewhere in the world. It has been estimated that Africa is losing some USD 850 million a year in additional interest paid solely to buy inventories in advance. This estimated loss was 40% higher for African firms than for businesses in East Asia.

Inefficient customs operations at ports and land boarders in Africa can also cause difficulties. It takes an average of 35–40 days to complete complicated boarder crossing procedures and paperwork (one-third longer than in East Asia), resulting in drivers having to queue for days while the process of getting products across takes place. The length of time it takes to clear customs poses difficulties to what otherwise should be a seamless activity. WEF concluded that inland transport costs and weakness in transport and logistics sectors in Africa are major factors that have held back Africa's trade and economic development.

Matsaert (2015) says that transport and freight costs in East Africa are among the highest in the world, with freight logistics expenditure more than 50% higher per kilometre than in Europe or the USA. This extra cost is caused by a "logistics gap" resulting from poor or lack of infrastructure, inadequate warehousing facilities, poor road and rail transport and a low level of investment in technology. This gap is even more pronounced in landlocked countries such as Rwanda, Burundi, Mali, Burkina Faso, Botswana, Zimbabwe and the Democratic Republic of Congo, where transport costs can be as high as 75% of the value of exports.

Box 2.1

Frank Matsaert, a company chief executive, noted that in East Africa transit times are high from Mombasa (Kenya) to Kigali (Rwanda)—on average of two and a half weeks for a journey of 1600 kilometres. Freight trucks stop at two border posts and encounter 45 road blocks, each of which involves delays and costs, as well as potentially damaging the goods in transit. In contrast, a truck covering a similar distance in Europe—driving from Rotterdam (the Netherlands) to Budapest (Hungary)—would be able to complete the route in less than a day. Transport expenses are passed on to small businesses and customers. The World Bank estimated that logistics costs account for 40% of consumer prices in East Africa with a population of about 250 million people. A large number of small business owners are therefore unable to grow their businesses due to high logistical, sourcing and distribution costs.

Although the World Bank and African Development Bank (ADB) are reported to invest USD 93 billion and USD 50 billion respectively every year in order to bridge the infrastructure gap, the real problem is implementation. The economic imperative appears to be growing at a faster pace than the required political reforms, but what is necessary is a balance between the two for the required effective partnership between economic entities and political imperatives. The business environment has to be conducive to enabling investment to get the product to market. Investment in trade can be futile without an adequate supply chain infrastructure system in place. Intra-African trading activities can flourish successfully only with adequate transport logistics infrastructure.

Box 2.2

2.2.1 When African children drink Milo Chocolate drink or Bunvita, they are not aware that they are imported and that 45% of the cost covers transport and logistical resources. The product may have been made in Africa or overseas, whichever is applicable the children (or their parents) are paying part of the freight clearance charges, handling charges, insurance, fuel costs and wages of the freight driver who moved the product from point A to point B. Consumer goods cannot improve people's lives if the cost of importing them is too expensive for people to access.

2.2.2 Three little boys in Kigali are sharing a lollipop. They lick it in turns. The lollipop is imported, therefore 45% of its cost is due to transport and allied costs. It might have been made in Kenya or Tanzania or even further afield, and it might have travelled thousands of kilometres and passed through several borders. Whichever of the boys bought that treat has paid part of the freight clearance charges, handling charges, insurance, fuel costs and the salary of the trucker who brought it to the Rwandan capital.

The cases in Boxes 2.1 and 2.2 illustrate the significance of the activities in the supply and demand pipelines and how, to a great extent, they contribute value to the end customer. Therefore logistics and supply chain processes are essential as they create and deliver value to the market. Logistics is the element that determines the quickness (lead time), reliability and sometimes the size and location of inventories and facilities.

Despite the challenges facing trade logistics in Africa, the low cost of labour in Africa has driven renewed efforts from continental and inter-continental traders to exploit Africa's potential as a trading base, thereby raising the role of logistics and transport in the region (Box 2.3).

Box 2.3

DHL, the international parcel company, has more than 3300 service points across Africa. The network was developed by forming partnerships with small businesses, fuel retailers and supermarkets. DHL has grown a successful business in Africa by adapting to the local circumstances of informal economy, rural population and a large number of small businesses.

For many companies, however, the prospect of entering the African market poses too many challenges due to the inadequate logistics and supply chain resources that do not get beyond an individual country's national boundaries. What should be imperative to a willing trader is to

identify the linkages between national logistics realities and the continent-wide logistics requirements.

2.4 Electronic Technology in Logistics and Supply Chain in Africa

Within an organisation's product and service offering, technology plays a crucial role in the value chain. Well co-ordinated and integrated logistics, assisted by the application of information and communication technology, will bring the basic advantage of more efficient, cost-effective supply chain operations. This simply means that technology will help to unify the purpose of an organisation and its supply chain partners and help them to avoid duplication of effort, reduce waste of resources and enable better information sharing. In addition, the appropriate application of electronic technology will increase the speed of movement through the demand and supply pipeline, make planning easier, reduce uncertainty and variability, and eliminate barriers that may result in high levels of inventory holding among production, the warehouse and the retail outlets. Advanced digital technologies will help business models in Africa. Technology will drive a dramatic shift in how trade is conducted. Businesses in the global arena are witnessing increased market volatility in an intense competitive environment, thereby forcing new pressures and new approaches to doing business. Therefore, in order to deliver economic and outcomes, Africa will need to navigate the current shift and reinvent their logistics operations landscape to help to transform trade and economic development throughout the continent. International entrepreneurs doing business in and with Africa would need to collaborate with African national and regional governments to blend freight logistics and supply chain strategies with new technologies in order to deliver trade benefits to Africa. By establishing partnership engagements between business investors and African governments, the burden of trading and the cost of investment in new logistics capabilities will be shared, thereby propelling greater market successes.

2.5 Logistics Infrastructure in Trade and Development

Infrastructure in this chapter is defined as the basic physical transport systems for the business of trading that are vital to a country's economic development and prosperity. Discussion on transport infrastructure in this section will focus on roads, railways, airports, seaports and services provided by the sector networks that are crucial in moving goods and services from exporting and importing countries to Africa. It will examine how key infrastructural services support and impact on trade and development in Africa.

Transport infrastructure plays a crucial role in the flow of international trade and therefore needs to be more efficient and effective. Making infrastructure facilities more functional may involve government policy measures and regulatory reforms that will be complementary to the provision of high-quality physical infrastructure for trading. Trade depends on institutional quality and exporter's and importer's access to well-developed transport and communication infrastructure systems.

Logistics infrastructure in Africa will be examined from two critical perspectives: transport infrastructure and regulatory reforms.

2.5.1 Transport Infrastructure

Freight transport infrastructure is the bedrock of Africa's trade and economic development. However, lack of effective, well managed infrastructure that allows reliable transport services is the single largest barrier to trade in the continent. New Partnership for Africa Development (NEPAD) (2010) reported that the challenges inherent in creating an infrastructure network that will not only connect Africa with the rest of the world, but also integrate individual countries within the continent itself are many. This section examines the current state of Africa's transport logistics infrastructure system, including road, rail, sea/waterways and air as they are closely connected to the economic, technological and social renaissance of Africa.

Road Transport Mode Road transport is the most dominant mode of transport in Africa. It accounts for 80% of goods traffic on the continent. Road freight generally bears the brunt of poor infrastructure and that constitutes a considerable challenge for logistics in African trade and economic growth. The road transport system is affected by a variety of issues including road infrastructure development and maintenance, truck fleet management and maintenance, road safety, human and institutional capacity building, gas emissions, the environment as well as financing, among others. Many countries on the continent do not have adequate human and financial resources to construct roads and maintain them to international standards. In Africa, road network development has been inadequate, and existing roads are poorly maintained, resulting in a perennial bad road network, especially during rainy season.

The challenges of difficult topography, heavy vegetation and roads being destroyed by overloaded trucks have meant that logistics and supply chain operations have not had much impact. The lack of a defined strategy for road freight transport infrastructure has not made it possible for other transport modes such as air, rail and shipping to complement road freight in an inter-modal context.

Additionally, factors such as war and conflicts have prevented progress in road construction. Regional conflicts have led to the destruction of roads and river crossings as well as the prevention of maintenance and the closure of vital links. For instance, Sierra Leone, Liberia, the Democratic Republic of Congo and Angola have experienced retarded development following wars. Wars in the Democratic Republic of Congo set back the development of road infrastructure in the country by decades and cut the principal route between East and West Africa. Similarly, for many years, security considerations due to conflicts have restricted road travel in southern parts of Morocco, Algeria, Libya and Egypt as well as in northern Chad and much of Sudan.

As a means of addressing the problems of road transport, the United Nations Economic Commission for Africa (UNECA), the ADB, and the African Union in conjunction with regional and international com-

munity developed a plan for a trans-African highway network comprising transcontinental road projects in Africa. They aimed to promote trade and alleviate poverty in Africa through highway infrastructure development and the management of road-based trade corridors. The road network strategy, with a total proposed length of 56,683 km (35,221 miles), aimed to link Africa's capitals and other commercially important centres of production and consumption. It was designed to encompass nine major routes: Cairo to Gaborone (Pretoria/Cape Town), Lagos to Mombasa, Dakar to Djamena, Ndjamena to Djibouti, Algiers to Lagos, Beira to Lobito, Tripoli to Windhoek (Cape Town), Lagos to Nouakchott, and Cairo to Dakar. When completed, the road had been estimated to generate an expansion of overland trade of USD 250 billion over 15 years.

However, to date the continent is yet to fully achieve the implementation of the trans-African road network objectives due to lack of adequate overland links between the countries, and a lack of economic and political will by national governments to construct motor-able roads in individual countries. Despite the limitations posed by individual national governments however, regional community blocs are positively involved in the trans-African highway development as they work in conjunction with ADB and UNECA on projects within their economic zones. Notable examples of such projects include:

- the Arab Maghreb Union – driving the development and maintenance of the Tripoli to Nouakchott highway;
- the Economic Community of West African States (ECOWAS)—driving the development and maintenance of the Dakar to Ndjamena and Dakar to Lagos corridors;
- the Beira to Lobito highway—linking Angola to Mozambique;
- the highway to link the southern ends of Tripoli in North Africa to Windhoek in Namibia and further to Cape Town in South Africa;
- the Cairo to Gaborone highway, which makes use of regional highways developed by the Southern African Development Community (SADC); and
- the SADC – with an extensive network of road projects and trade corridors in Southern Africa. SADC manages road and rail corridors from landlocked areas to ports.

The East Africa Community is the fastest-growing bloc on the African continent. Success has been incremental but effective. Since 2008, freight volumes through East Africa's major ports, Mombasa and Dar es Salaam, have grown at 8% and 13% per annum respectively. With this growth came major transport and logistics investment opportunities that handled the increased freight volumes. But there are still areas of stalled or stunted regional initiatives to remove barriers to trade and investment. For many smaller economies, especially the landlocked ones, regional integration should be a necessity in their policy. Building trade blocs with neighbouring countries will help small landlocked countries to get access to ports. This will help them to achieve economies of scale, facilitate investment, break into multi-country production networks and increase private sector competitiveness. The strongest elements for integrated economic transformation however are the necessary political will, visionary leadership, a focus on delivering tangible development and joint monitoring by both public and private sectors.

Although a pan-Africa road infrastructure alliance to facilitate trade has not been fully achieved, the efforts of regional economic alliances, as mentioned above, in facilitating trade among member countries are encouraging. It is noteworthy that countries within the individual alliances have benefited from regional integrations through free movement of goods within their communities.

Box 2.4 The Dangote Group

The Dangote Group operates the largest fleet of trucks in Africa with over 10,000 trucks deployed for logistical activities, distributing a variety of products such as cement, flour, pasta and sugar across the African Continent.

Aliko Dangote, Africa's richest man and foremost entrepreneur, is setting up a $100million Vehicle Assembly Plant in Lagos, Nigeria. The Plant will be producing heavy duty trucks for distribution of products both locally and across the continent. The Dangote Group project will be partnering with a leading Chinese company, National Heavy Duty Truck Group Company Limited, SINOTRUCK to produce several thousands of trucks for haulage movement. The multi-million dollar deal signed in May 2014 in China will have an assembly Plant that would produce 10,000 trucks annually. In the partnership equity stake, Dangote Group will own 60 per cent whilst SINOTRUCK will retain the remaining 40 per cent. This initiative is expected to boost entrepreneurship and economic development across Africa.

Culled from *Nigerian Vanguard Newspapers*, 16 January 2017.

The Aliko Dangote initiative (Box 2.4), is an example that can be replicated by national governments, regional economic blocs and the African Union. As found by other developed economies, it is imperative to focus on collective approaches to strategic and transformational movement with the purpose of strengthening logistical resources and management capacity with the necessity to leverage support for continental logistics infrastructure. It is vital to identify Africa's logistics requirements and align those needs with achievable and realistic targets.

Rapid gains in the efficient transportation of goods and services across Africa can be achieved with the elimination of bureaucracy and road block bottlenecks. Reducing the time taken for the movement of cargo from Mombasa to Uganda from 18 days to five days should not require a significant investment of money. It should be about doing what is right and getting it right to eliminate the waste of time and effort.

Rail Transport Railways are the most cost-effective way of moving bulk cargo long distances over land. Rail freight is vital to Africa's economic well-being. It has an essential place in providing an efficient movement of goods and services across the continent of Africa and creating value through its part in an integrated supply chain.

Trains are most useful in the movement of containerised goods between ports and capitals. The huge capacity of trains to carry large quantities of goods and deliver cargo to destinations along the supply pipeline as they move from depot to depot makes railway distribution more cost effective compared to that carried out by road. Rail freight distribution is also more sustainable. Trains burn less fuel per tonne mile than road vehicles and can have as many as 30 wagons while requiring only one driver. The additional benefit of the railway is its safety: the security of freight in transit, a lower incidence of accidents, reductions in road congestion, and lower levels of fuel emissions are significant characteristics of rail transport.

Rail freight has a particularly large potential for Africa's current and future development as containerised imports and exports increasingly become the basis of international trade. The development of rail transport has begun to attract increasing attention from national governments across Africa.

Box 2.5

2.5.1 Kenya Standard Gauge Rail

In Kenya, there is the construction of a 500 km standard gauge railway from Mombasa to Nairobi, aimed at cutting the traveling time between the two destinations from 13 hours to 4 hours with a train speed of 80 km h^{-1}; and a 1250 km rail line that runs from Mombasa to Kisumu to Malaba with the purpose to reduce cost of cargo transporting by 60% at the completion of the project. The rail project is designed to link Kenya's neighbours: extending from Mombasa to Nairobi, linking Kisumu through to Kampala in Uganda, and South Sudan, and Kigali in Rwanda, then to Juba, connecting four countries together. The regional rail project had been designed to boost East African trade and development as well as deepen economic integration in the region.

2.5.2 Angola Standard Gauge Rail

The railway route is 3523 km long and connects Lobito in Angola to Beira in Mozambique, running from border to border, crossing Angola, the most southerly part of the Democratic Republic of Congo (DRC), Zambia, Zimbabwe and central Mozambique. This means copper can be easily transported from DRC to Angola and to the Atlantic Ocean for export. The project was designed to have a profound impact on business in Central and Southern Africa.

2.5.3 Ethiopia's Light Railway Project

Ethiopia has been slow to embrace railway transport for decades. The diesel-powered Addis Ababa–Djibouti city railway built by the French in the twentieth century has long been dysfunctional, but in 2011 the Ethiopian government agreed a contract with the Chinese to build a light railway transit that can transport 15,000 passengers per hour in each direction. The train will speed up passenger journeys and provide an alternative means of public transport to the city's road-based system as well as provide a more environmentally friendly transport option. The national electric rail project costing USD 475 million, covers 34 km (21 miles) of light rail and it is a joint venture between Ethiopia and China and is the first of its kind for the city and sub-Saharan Africa. The light rail system, which was part of a five-year "growth and transformation" project of the Ethiopian government became fully operational in 2016. Although the light railway is passenger focused initially, it may be useful to conduct business and move goods in the future.

2.5.4 The Abuja–Kaduna Gauge Rail Project

The project was expected to open up the northern part of the country as it is designed to connect the line that runs from Lagos to Kano. It was designed to carry more than 5000 passengers daily, with trains travelling at 160 km

per hour and carrying more than three million tonnes of cargo annually. On completion, the train journey will take 90 minutes, a journey that normally takes three hours by road. The railway is being built in segments. Only the section between Abuja and Kaduna has been completed so far, and services began officially in July 2016. The leg between Lagos and Ibadan is under construction. A USD 1.53 billion contract was awarded in 2012 to the China Civil Engineering Construction Corporation for construction of the Lagos–Ibadan segment (156 km) of the standard gauge railway by 2016. However, the project has faced delays. A ground-breaking opening ceremony finally took place on 7 March 2017 and the railway is expected to be completed by December 2018.

Other parts of the construction that have not yet started are: Ibadan–Ilorin (200 km), Ilorin–Minna (270 km), Minna–Abuja, and Kaduna–Kano (305 km). When all phases are completed the rail will link Lagos from the sea to Kano in northern Nigeria.

2.5.5 First High Speed Rail in South Africa

The 80 km Gautrain rapid rail link has brought high-speed commuter communications to Gauteng province, the smallest of the country's nine provinces, but the most important economically and the most densely populated. Gauteng is at the heart of the South African economy. It creates one-third of South Africa's GDP and is home to around 10 million people, one-fifth of the country's population. It also includes the country's largest city (Johannesburg) and administrative capital (Pretoria), as well as the OR Tambo International Airport.

With the provision of the high-speed transit link, the government's expectation was to stimulate economic growth and job creation by improving commuter mobility as well as reduce traffic and carbon emissions on congested highways.The contractor, ABB traction technologies, is playing a vital role in the project by providing advanced traction solutions that powers the entire 80 km line and the 24 electric trainsets that operate at speeds of up to 160 km h^{-1}.

Box 2.5 (2.5.1 to 2.5.5) contains stories of African efforts on investment on rail transport infrastructure for the facilitation of trade and economic development in the continent. They however need to do more by giving optimum support and attention to the success of the trans-African highways network initiative of ADB and UNECA to facilitate the movement of goods and services for efficient and effective intra-African continental trade.

Sea Transport Maritime trading dominates exports and imports. It is less agile but cheaper than the other modes of transport. Shipping in African trade is notable as the traditional means of moving large amounts of cargo from Africa to other continents. However, the facilities at African seaports are still behind the global acceptable level due to the poor level of investment in port infrastructure, thereby limiting the pace of trade to and from the continent. In order to respond to international market demand and competitiveness, Africa will have to refocus its sea transport strategy to improve and enhance cargo services to and from their extra-African trading partners. The adoption of modern shipping transport technology that enables ships to propel quicker and cruise faster will require innovation in African trade logistics. Indigenous African traders doing business in the continent will also benefit from modern port-centric technologies that will enable trade to flow across national coasts in Africa.

Sea ports are the key enablers of inter-modal transport connections. For instance, landlocked countries in sub-Saharan Africa can be served by connecting waterways, road and rail transport to the west coast ports of Lagos in Nigeria and Dakar in Senegal, the ports of Dar es Salaam in Tanzania and Mombasa in Kenya on the eastern seaboard, and the three southern ports of Durban, Maputo and Cape Town. Other newly developing African ports, such as the port of Lamu in Kenya, can serve as a gateway connection to Southern Sudan and the Democratic Republic of Congo, while Nacala and Beira ports in Mozambique will serve the SADC region. Although the impact of these new ports may be small, their network connections with road and rail infrastructure can help to open up the African hinterland.

A major disadvantage, however, is the vulnerability of the landlocked countries. In the event of any crisis that closes a port of trade, landlocked countries will be directly affected. For instance, incidents like the 2007 Kenyan election protests affected the output of Mombasa and the Transnet strike in South Africa closed down Durban port for several days, so goods did not reach the inland countries they would normally serve.

Inland Canals and Waterways Transport on rivers, lakes, lagoons and canals is crucial to logistics infrastructure and trade. The Nile, Niger, Congo and Zambezi are important transport routes. Similarly, lakes used for transport include: Lake Victoria in East Africa; Lake Malawi in Southern Africa; and Lake Chad in West Africa to mention just a few.

Water transport is excellent for goods transportation, particularly in riverine areas in most African countries where there is a lack of or limited access to communities and goods that need to be moved around the hinterland.

2.5.1.1 Air Transport

The African continent is characterised by vast areas of land with no good roads or railway network. Transport by air, therefore, would seem to be the strong option for freight movement and distribution. Air cargo services have witnessed a gradual increase in the last few decades, however, the domestic air market has shown a very low level of development and international cargo flights have remained restricted by anti-competitive regulations across African continents.

Despite Africa having 15% of the world's population, the 230 airlines operating in African airspace operate just 5.5% of the world's commercial and freight aircraft. The main reasons for such a small number of air services in Africa are due to air infrastructure shortages and limited competition in the air cargo market. In addition to this, there is a lack of a well developed network of domestic airports and air cargo services, which proves particularly problematic in Central and Western Africa.

As the number of middle class households is on the rise in Africa and estimated to reach 128 million in 2020, growing from 85 million in 2008, it is expected that a corresponding demand for goods will increase, people will travel more and buy more goods (McKinsey 2015). Air transport therefore plays a critical role in the distribution of goods to landlocked African countries such as Niger, Mali, Burkina Faso, Luanda, Rwanda, Burundi, Zambia, Botswana, Zimbabwe and Central African Republic where land routes can be rough and lengthy with a high risk of delay at the borders. The International Air Transport Association reported that in the last quarter of 2014, Africa enjoyed a 10.5% growth in demand measured

in freight tonne kilometres, which represents twice the 4.2% growth of the global freight market over the same period. This indicated a strong demand for air freight from importers and exporters. In twenty-first-century Africa, companies are increasingly opting for air instead of sea transport for urgent shipments of products, particularly in crude oil and pharmaceuticals. Hughes Marchessaux, air freight director at Bollore Africa Logistics, emphasised that the development is a reflection of the global market for air transport that accounts for just 1% of the volume of goods transported but 35% of the value. Up to 2018, however, Africa remains the smallest user of air services in the world due to its low income and lack of air transport infrastructure, despite the air transport sector being a major contributor to African trade particularly for time-sensitive products such as agricultural produce and intermediate production networks.

Although it is difficult to find detailed data on intra-African air transport, The international Bank for Reconstruction and Development (IBRD)/The World Bank (2009) indicated that air freight is crucial to developing countries, particularly the landlocked countries. According to the report, landlocked African countries have limited demand for air freight because most of the enterprises are small businesses with low production capacities and low-value goods such as flowers, fresh fruits and vegetables, and electronic parts, which only require small volume of shipments. The critical strain for African enterprises is the ability to generate production capacity to attract air freight services that are both frequent and competitive. Air transport costs in Africa are above the world average, thereby inhibiting the development of exports with high value added. This stems from the belief that fuel tends to be significantly more expensive in Africa than in other regions. For instance, fuel prices in Africa are often 40% higher than in Europe (Amjadi and Yeats 1995). Amjadi and Yeats estimated that air transport cost represents, in some cases, up to 50% of the value of African exports to the USA. High and rising costs of air transport services have a direct impact on the cost of cargo flights to Africa. IBRD/World Bank (2009) reported that in the short run higher cost of fuel would normally result in a possible downturn of air cargo traffic, and in the long run, with a continuous, albeit slow, growth, air freight would be integrated into multi-modal supply chains that could provide some form of balance between cost and time. The report further stated that air freight would also open new markets by providing fast, reliable service for initial deliveries of products, and continue to support production activities and delivery of critical

spare parts and high-value inputs. The report also emphasised the significance of air freight in supporting reverse logistics activities including repairs and warranty work for electronic and other high-value consumer goods.

Other militating factors include the variation in the quality of air infrastructure across the continent; difficulties in finding airports big enough to accommodate some of the larger cargo planes, especially in sub-Saharan Africa; and the lack of ease of loading and unloading at some airports due to inadequate landing equipment.

African governments' slow response to liberalise is a critical issue in inter-African air markets. Liberalisation can stimulate both intra- and inter-continental demand for air travel and create competition and service improvements, as well as lower costs that may accumulate while business is being conducted.

Air transport infrastructure is a necessary condition for economic growth and, though it cannot reduce poverty in itself, it has a key role to play as a facilitator of policies that aim to improve living standards. In twenty-first-century global trade, air transport has played a key role in fostering economic development and making countries more competitive and productive. Aviation therefore has the potential to make an important contribution to Africa's continued economic growth because it can help open markets and facilitate trade.

InterVISTA reports (2015) reviewed the Yamoussoukro Decision of 1999 signed and adopted by 44 African countries as full liberalisation of intra-Africa air transport services in terms of access, capacity, frequency and tariffs; fair competition on a non-discriminatory basis; compliance with international safety standards; and a requirement for implementation of the agreement. The report, however, noted that the implementation of the Yamoussoukro Decision still remains to be seen. This is because there are still constraints such as:

- protectionist policies favouring national airlines;
- discriminatory practices in favour of other continent's carriers;
- severe restrictions on African carriers; and
- non-physical barriers such as harsh visa requirements.

African countries will need to work more collaboratively for the benefit of African trade and development. An emergence of an attractive inter-

African market will encourage a trend towards new alliances and acquisitions. Good examples are South African Airways acquiring a 49% share of Air Tanzania and a restructured Kenya Airways sold to private investors.

2.5.2 Regulatory Reforms

Logistics infrastructure often requires government ownership or regulatory control because of its inherent monopolistic nature. Roads, rail, seaports including waterways and airports are the most common infrastructure elements that exist along nodes and links of transport network systems in Africa and governments play a dominant role in the building and maintenance of these facilities. Nevertheless African governments still have a relatively weak consideration for a common legal framework to cater for the complexity and cost of regulatory processes necessary for trans-African logistics and supply chain network design.

In order to make the impact of logistics infrastructure feasible, the existing complex and bureaucratic port regulations in Africa need a review in order to eliminate unnecessary administrative activities at rail and road borders and at sea and airports. Deregulation of the system to remove needless requirements will enable freight agility across the continent. A new legal framework to remove out-of-date tariff structures and archaic restrictive laws, as well as to identify and confront non-tariff barriers such as corruption, to facilitate movement at the borders in order to ease intra-African and Afro-inter-continental trades are policy measures that will enhance efficiency and increase competition.

Although institutional reforms are steadily taking place in the African freight transport sub-sector (Box 2.6), many countries have yet to adopt a global best practice approach. In contrast, in developed continents such as Europe and North America, transport infrastructure assets have embraced the public–private partnership approach in ownership, maintenance and financing, allowing deregulation and market forces as an effective mechanism for competitiveness. Liberalisation (privatisation and commercialisation measures) will help to improve financial performance through value-added and efficient use of logistics infrastructures.

Weak institutions that have a negative impact on trade, a poor management of ports and borders as well as cumbersome custom procedures

accompanied by extortions that contribute to delays and a slow down of supply chain activities need a stronger regulatory framework.

Box 2.6 Transport and Trade Facilitation

A number of bilateral agreements on international road transport have been signed by several African countries. For example, The Central African Economic and Monetary Community (CEMAC) Trade Corridor Project in 2006 approved transport facilitation master plan aiming at improving efficient regional trade among member states and improved access to world trade.

In West Africa, the Economic Community of West African States (ECOWAS) and, the West African Economic and Monetary Union (UEMOA) members states agreed a convention that provides guidelines for road transport services for uninterrupted transit across country boundaries. The regional community also agreed to improve the implementation of the common vehicle insurance scheme known as the Brown Card. The scheme also covers third-party liability and medical expenses as well as the Automated System for Customs Data (ASYCUDA), aiming towards overcoming delays in reporting of traffic movements and locations. Similarly the Inter-state Transport convention (TIE) and the Inter-state Road Freight Transit convention (TRIE) adopted in 1982, aimed at the establishment of joint border posts, which, among other things, would accelerate the traffic and address issues of variations in working hours at adjacent border posts.

In Southern Africa efforts to improve trade facilitation include the launching of the Regional Trade Facilitation Program (RTFP), a key component of which is the One Stop Border Post (OSBP). The OSBP involves measures including harmonization of customs clearance procedures at border crossing points.

Similarly, in Eastern Africa, the OSBP aimed at improving the efficiency of rail traffic between Kenya and Uganda has been established at Malaba. In the Eastern and Southern Africa sub-region, COMESA and SADC have adopted a number of protocols related to transport facilitation. They have also adopted measures for facilitating transport and transit between their member states. There are also plans to bring down the number of road blocks between Kenya and Uganda on its Northern Corridor (which comprises a rail and road network that links Kenya to the Great Lakes countries of Burundi, Democratic Republic of Congo, Rwanda, Southern Sudan and Uganda) from the current 47 to 17.

In a similar move aimed at improving transport and trade facilitation, a corridor management mechanism of the Central Corridor linking the great lake countries to the port of Dar es Salaam was put in place in 2005. During the same period, preparations were underway to establish corridor management groups for the North-South Corridor, linking DR Congo, Zambia, Zimbabwe, and Malawi following the implementation of the corridor management initiative important results have been achieved. For example, the journey time from Mombasa to Kampala, had been reduced from 10 to 6 days.

Source: UNECA Report, October 2009.

2.6 The Future Impact of Logistics and Supply Chain on Trade and Development in Africa

There is a fast-growing demand from around the world for the vast raw commodities available on the African continent. Africa has an abundance of oil, gas and mineral resources with significant opportunities for agricultural expansion. Experts view that Africa is growing more strongly in 2018 than at any time in its recent history with its rising wealth creating a surge in demand for a broad range of products. Meeting that demand across Africa's diverse physical, economic and political conditions will require companies trading in Africa to be extremely innovative, flexible and proactive in their supply chain approaches.

Earlier in this chapter, we mentioned that the key issues hindering successful logistical operations in Africa revolved around inefficient links in Africa's supply chain model, resulting from inadequate infrastructure, high transport costs and complex regulations at the ports. The most successful traders in Africa will therefore be those that have an awareness of these limitations and recognise the advantages of managing their supply chains as a competitive business and positioning that as an essential component of their trading policy in Africa. They will have the ability to adapt their businesses and supply chain models to suit Africa's unique characteristics by harnessing resources to manage their operations efficiently and effectively. Africa has become an investment destination for many countries around the world, and transport logistics has taken on greater roles in African trade. Whether you are moving resources off the continent or bringing goods and services into it will continue to be determined by the nature and quality of infrastructure and the efficiency of Africa's transport networks.

Intra-African trade is low in comparison to its global counterparts for the reasons of poor infrastructure and because most economies in the continent are supply based. Currently only about 11% of Africa's trade is with other African trading partners, compared to Asia where half its trade is between the countries in the Asiatic region. There are transport

infrastructure barriers to trade and it takes a substantial amount of time and money to cross borders. Political will among African governments is needed to establish transport logistics policies that will give adequate consideration to an African market of the future that will enable the building of an adequate infrastructure for efficient and agile supply chains and distribution networks, and ultimately support the creation of enterprise and economic growth and development. This new thinking should be part of a continental-wide trade agreement—a strong Africa free-trade zone framework in which removal of unnecessary tariff and trade barriers will be critical to accelerated economic development on the continent.

South Africa is rated the best performer in Africa in trade facilitation logistics and among the best in terms of transport infrastructure. South Africa's overall transport infrastructure is almost at the same level as that of India and better than that of Indonesia. But although South Africa continues to show strong infrastructure capability, it has the lowest projected annual growth at 3% for the period 2012–2017 of the ten economies surveyed (Band South Africa 2012).

As the need for gateways to connect Africa to the rest of the world is increasing, there are not enough ports to handle existing traffic. The plan to build and expand five major ports at Beira do Dande and Lobito in Angola, Lekki in Nigeria, Musoma in Tanzania, and Lamu in Kenya might bring hope for change. For instance, many multi-national companies desiring to expand into West Africa see Nigeria as a major gateway to the region. Nigeria is regarded as the largest market in West Africa, with a population of more than 180 million of the 250 million people living in West Africa. With 50% of the population living in urban cities and the middle class growing rapidly, Nigeria ranks as the world's fourth fastest growing economy, largely driven by oil exports. This makes the country a leading destination for international investors.

In recent developments in the last decade or so, the Chinese government and state-owned enterprises are looking to Africa for hydrocarbons and other raw materials. In return China is financing massive infrastructure projects in the sub-Saharan region. For instance, China is supporting a host of infrastructure projects in South Africa, Tanzania, Ghana, Mozambique and Nigeria.

Similarly, Ghana with its current favourable business environment, is also gradually establishing itself as an important gateway to the West African market. With a similar optimism and despite the constraints in its growth potential and its inadequate logistical infrastructure, Mozambique will progressively become the fourth largest exporter of liquefied natural gas globally and the second largest in Africa after Nigeria, according to the Organisation for Economic Co-operation and Development.

An interesting feature of note is that each country in Africa has its own value proposition despite their urgent need for investment in road, rail, air and port transport infrastructure to support trade and economic growth. International investors will have to recognise the potential in Africa and be encouraged to partner with governments to invest in transport and logistics infrastructure in order to unlock the economic value of the continent and provide businesses with great opportunities for a better trade environment.

In conclusion, the African continent needs better transport infrastructure, more connectivity across borders and an improved business environment to reach its potential. African governments must provide the required enabling environment for trade. They need to realise that the ability to compete as a region in a global economic arena is critical and dependent on an efficient and effective logistics system. It is therefore important to develop knowledge that will enable international supply chain partners and industry sectors to collaborate for improved international competitiveness and to influence the development of the national system to address holistic logistics requirements.

The inclination to adopt and apply modern technology is another area for improvement and development. The complexities and scale of transport logistics in the twenty-first century have necessitated the introduction of information and communication technologies to determine routes and distances between points more accurately. Advanced port technology is most needed in African ports to facilitate quicker and easier processing of cargoes for the purpose of decongesting ports and to enable efficient and timely movement of goods to distribution centres. The topography of Africa presents unique, varied and continually evolving challenges to supply chains; therefore the continent needs more modern

and user-friendly advanced technologies at the various ports for the benefits of both domestic and international markets.

Logistics efficiency will be improved if decisions are based on accurate information. In Africa, like everywhere else, during the initial uptake of technology, businesses tend not to share information with their trading partners for fear of losing a comparative advantage. However, there is a strong need to understand the significance of modern electronic technologies in facilitating business communications and synchronising logistics and supply chain processes and activities both in intra-African and with Afro-inter-continental trade partners. Greater investment in advance electronic transport and communication technologies will turn out to be to the benefit of Africa, Technology will enable quicker, better and fairer trade that will have a major impact on trade across the African continent and make Africa's value chain much easier to achieve.

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3

Supply Chain Network and Logistics Management

Benjamin S. Bvepfepfe

3.1 Introduction

The continent of Africa experienced long years of colonisation due to its wealth of natural resources that provided the much-needed raw material for Europe during the Industrial Revolution. Since then, the continent has been a source of timber and other agricultural produce such as: tobacco, cocoa, coffee and cotton for international markets. More recently, however, there has been another dimension to the economic activities in some parts of the continent. This includes recent discoveries of diamonds in Zimbabwe; oil and gas deposits in Nigeria, Ghana, Angola and Mozambique. It has also been reported that seven of the ten fastest growing economies in the world are in sub-Saharan Africa (Kearney 2014), and that the region is the second-fastest growing economy in the world (IMF 2015). The continent is reported to be a major market for

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China, with one of the world's largest economies, whose investments are targeting mining, agricultural produce and infrastructure opportunities.[1] There are also suggestions that Africa will surpass the USA and Europe as China's largest trade partner by the year 2020 (Manners-Bell et al. 2014).

We can assume that Africa is on its way to becoming a big competitor in the supply of raw materials. Similarly, the region has drawn much interest from retailers who aim to extend their supply chain networks to their pre-production suppliers. 'Supply chain network' here denotes the concept of a system of interacting processes and node points resembling a net that is connected together. The main components in logistics and supply chains include location of facilities for production and/or storage infrastructure, equipment for materials handling, modes of transport, information and communication systems and people, all working for a common purpose. The effectiveness of logistics and supply chain operations is largely influenced by the availability of these key components making up the logistics network in a given region. The World Bank noted that while logistics infrastructure is significant to Africa's economic evolution, its role in driving the continent towards even greater future development is crucial (Foster and Briceño-Garmendia 2010). Sustainable logistics and supply chain operations continue to be the real catalyst to economic development. However, it has been observed that supply chains in Africa are under-developed (Kearney 2014) and lack adequate logistics and transport infrastructure to support Africa's trade and economic development to a sustainable standard. In order for supply chain operations to facilitate the smooth flow of product/services, information and finance, a sustainable level of investment in network configuration and assets are required for intra-regional and global competitiveness.

The region appears to be attractive to foreign investment from abroad, both as a global market for finished products and as a supply source of raw materials for manufacturing.[2] The population of sub-Saharan Africa—estimated at 1.2 billion (Canning et al. 2015)—is projected to grow to 2.8 billion by 2060, representing more than 20% of the world's population. The World Bank (WB) reported that this growth contrasts with population projections for Europe, which will experience a negative

shift from the current 738 million (2010) to a projected 702 million by 2060. Researchers have noted that there is a link between population growth (with urbanisation) and economic development. They argue that population growth increases density, that is, the number of people in a given area, and allows companies to produce in large volumes leading to reduced costs. However, it has also been observed that the benefits of population growth are dependent on the policies and associated investments from governments: for example, local and national governments investing or providing incentives for investment in infrastructure and services to match the growth. The foregoing is based on the notion that existing infrastructure in some parts of Africa were designed for much lower throughput and usage and there has not been any corresponding capacity upgrades or improvements to match population and capacity increase. An IMF study finds that the largest dividend from population growth will be gained if government policies are focused on a set of interlinked actions, including fostering private sector development outside agriculture, bridging the infrastructure and human capital gaps, tackling labour market rigidities and supporting stronger trade ties. Supply chain operations are caught up in this growth demand fulfilment and other expectations.

The aim of this chapter is to highlight the importance of supply chain networks and logistics management capabilities on trade and development in the context of Africa. Evidence suggests that if a region has effective and efficient logistics capabilities, it will most likely attract significant economic growth. For instance, manufacturing companies from developed economies would outsource production processes to such regions. This chapter outlines the concept of supply chain network and logistics management in the context of developing regions such as sub-Saharan markets. The key features and notions of modern day supply chains will be explored with an in-depth analysis of the attributes of resourcing and managing supply chain networks. The chapter explores the key network challenges facing supply chain managers particularly for those businesses operating in sub-Saharan Africa. Although some reports exclude countries in North Africa, such as Libya, Morocco, Algeria, Sudan and Tunisia, this is mainly due to differences in the socio-cultural, political and economic settings.

3.2 The Nature of Supply Chains

Supply chain thinking entered the management literature in the mid-1980s, and most businesses are now associating their management approaches with the new theory of managing supply chain operations. The concepts of supply chain management (SCM) appear to be well received in the day-to-day business operations of industry. Adewole (2003) noted that there can be no doubt that SCM is a significant field; however, it has been difficult to define the scope under which the diverse research subjects can be connected. His assertion gives the reason for clarity of definition of supply chain at the early stage of the discussion. In addition, the availability and application of logistics and supply chain drivers such as infrastructure network capacity and associated technology have mixed effects on global supply chain operations. In Africa, trade and economic development are closely connected to the extent to which the region's supply chain networks are structured to accommodate the global business environment.

At this point, a good description of a supply chain would be helpful. Assuming that every product or service has a supply chain, this would imply that every activity or function should be part of that supply chain. What then is a supply chain? The definition that resonates in this chapter is one given by Bozarth and Handfield (2016). They define supply chains as "a network of manufacturers and service providers that work together to move goods from the raw material stage through to the end user". They opined that a supply chain network includes production locations, distribution and warehouse networks as well as the necessary infrastructure that facilitates the flow of services including information throughout the supply pipeline. Handfield and Nichols (2002) stated that supply chain operations comprise all activities associated with the flow and transformation of goods from raw material stage through to the final consumer. This implies that organisations and their business operations are part of the wider network and therefore every effort should be make in the design, resourcing and management of the network that form the linkages in producing and delivering a final product from source to consumption. There are a variety of barriers in effective network design, such as inadequate infrustructure capacity, lack of trust resulting from network partners, inadequate information flow, poor communication methods and supply chain variability, among others, that can impede

these flows. This calls for suitable supply chain network design and effective logistics management to reduce these barriers and their negative impact on the objectives of supply chain operations.

3.2.1 Material Flows

Assuming demand has been established, the key processes and activities of the supply chain are thus triggered, that is, beginning with supplies of raw materials that are required for the production process. Finished goods or semi-finished goods are then distributed through the supply chain network. To illustrate this, Fig. 3.1 provides a simplistic linear view of a beef products supply chain network. From a materials flow point of veiw, a supply chain can also be considered in terms of a pipeline through which goods and services flow from upstream sources to downstream consumers. The question now is how are decisions on the design of logistics networks made? One of the main aspect that influences decisions and therefore, the design of a logistics network is the principles of product characteristics. Consideration of product characteristics is essential in order to understand what is to be moved or stored, and what is it about the product that will require special attention or handling throughout the pipeline.

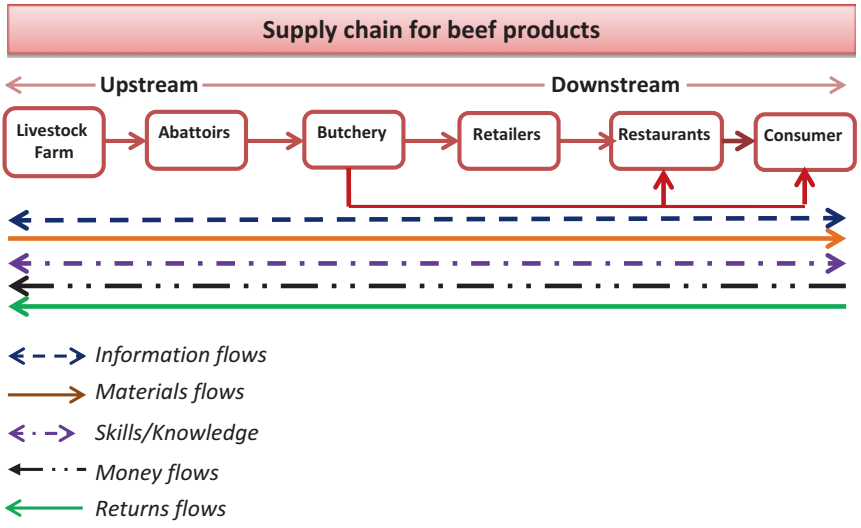

Fig. 3.1 Supply chain for beef products

3.2.2 Nature of Product

Products are grouped using a number of physical characteristics and other factors as follows.

Form of Product The physical form of the product—whether it is solid, a powder, liquid, gas, individual or loose properties—will determine the method and frequency of its movement as well as how it could blend in with other characteristics. For example, products may be perishable by condition or time, whilst others may be dangerous and hazhadous thereby requiring special handling and separation during transportation and storage. Many products are compatible and can move together in a chain, whereas many others must not be put together for health and safety reasons. Logistics operations management demands sound appreciation of these elements in the design of material flows through the network or pipeline.

Perishable by Condition Fresh fruit and vegetable produce; meat; fish; and most recently flowers (from Kenya and South Africa [SA]) have been moved across continents. These and other perishable products, such as pharmaceuticals, require special handling and packaging during storage, loading and transportation along the supply chain network. This is mainly because the physical characteristics of some of these products change while they are being moved within the distribution channel. Fresh fruit and vegetables give off gas and moisture; and bananas ripen during transportation—part of the planned process.

Perishable by Time These products include any with a "sell" or "use by" date, as well as products such as newspapers. Some drugs and medical supplies also fall into this group and the product life cycles are short, putting pressure on the network for effective and speedy delivery. Rapid transit within the network becomes essential and is a key performance indicator for logistics management.

Dangerous and Hazardous Goods Some products are toxic and dangerous to humans, animals and the environment. These must be moved under strict legislation standards and usually cannot by law be mixed with other products. For instance, mixing a potassium product with water will create an

explosion. Some chemicals are astringent, corrosive and combustible, such as acids, solvents and fuels. This makes movement planning very difficult. Care must be taken over combining products that have chemical properties that may not be compatible during the distribution process. For instance, fruit and vegetables such as mangoes, bananas and broccoli should not be held for more than a few hours in the same area, as they emit ethylene.

Bulk Products Bulk granular products such as grain, flour, powder and cement need to be segregated, as powders can combust with movement and heat. Most parts of Africa, especially southern Africa, have a strong agricultural base with a resultant export of produce within the region but also to global markets. Bulk liquids can be moved only in full container lots, as movement of a part-filled container will make the load unstable. Planning will demand full loads or an alternative design of a suitable system for dealing with movement.

Fragility and High Value Products Some products are fragile, such as pottery, tiles, glass, furniture and art, and they must be protected in transit and storage. Special packaging and labelling may be necessary. High-value goods, such as gemstones, currency, microchips, electronics, works of art as well as specialist medical supplies, will require special methods of movement and storage to eliminate potential loss from theft.

Transportation and Handling Characteristics Each product must have a clear instruction as to how it can be handled, made safe from contamination and packaged to eliminate damage. Likewise, each product must have a clear description of how it can be physically loaded/unloaded onto/from a vehicle and stored in a warehouse.

From the above, it becomes clear that the design of a supply chain network needs to take account of a product's characteristics, identifying flexibility and potential combinations, including any additional resources associated with the flow. For instance, a bulk liquid chemical tank or bulk liquid food tank must have a chemical clean out at a regulated cleaning station before a subsequent reload. This requires appropriate facilities, that will incur additional costs and adding more time to the supply chain process. This entails that network design must recognise the inherent physical

stages of a storage and movement process, where delays will be incurred (eg., cleaning station, loading or offloading) and the appropriate scheduling for receiving and deliveries. It is also necessary to identify any flexibility in the products being moved: what can be stored, loaded or moved together.

Case Study

One of the flows that forms the key link in this supply chain is materials travelling downstream to the end customer, for example feed to livestock, cattle to abattoirs, beef carcasses to butchers and sliced steaks and portions to consumers. Most of Southern Africa is suitable for livestock farming, for example cattle, goats and sheep.[3] There is evidence of increasing vertical integration within the beef supply chain in this part of Africa. For instance, in some cases feedlots own their own abattoirs and supply meat directly to consumers through their own retail outlets, a form of forward supply chain integration.

On the other hand, wholesalers buy live animals at auctions and slaughter these at abattoirs of their own choice for distribution to retailers. In Namibia, wholesalers allow consumers to buy carcasses directly from them. The network requirements for this supply chain include feedlots for live animals, appropriate transport systems, watering points during transportation (when necessary), abattoirs, and downstream, wholesalers, butchers and other retail outlets. Of course, sustainable supply chain operations should also consider upstream flows, sometimes referred to as reverse logistics in the form of returns or rejects. Note that this is a typical supply chain for local and domestics markets, and where regional or international markets are concerned there will be additional links that must be considered. For instance, import and export networks for international markets become paramount considerations in light of the safety restrictions that may be necessary. This will change the dynamics of the design and organisation of the supply chain network. For instance, in our previous illustration of a beef product supply chain we can add more nodes or location of distribution points (Fig. 3.2)

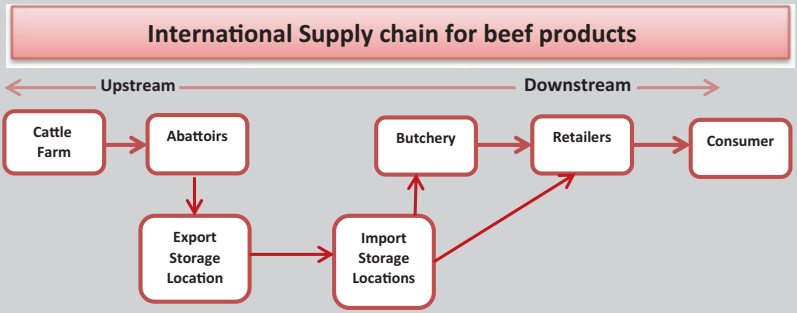

Fig. 3.2 International supply chain for beef products. (Source: author)

both for import and export, as this is a key decision factor for the supply chain performance. Using the same products for an international supply chain requires an additional network of storage facilities in export and import countries. This is necessary to ensure compliance with export and import health and safety requirements for the product. The nature of the product and mode of transportation dictates not only the speed of movement, but also whether it requires special handling and packaging during storage, loading and transportation along the supply chain network. It has been noted that in a majority of cases, goods are held in terminals or transit points unnecessarily because of insufficient documentation, resulting in costly repercussions on supply chain networks and operations.

In all cases, the objective of logistics and supply chain operations is to ensure that the right product or service in the right quantity and right quality is delivered to the right place and customer, at the right time and at the right cost. The flows in this supply chain are regulated for health and safety requirements and are also prone to seasonality and environmental risks, such as drought.

3.2.3 Logistics and Supply Chain Management

To the above six "rights", we can add a seventh right: with the right paperwork (information flows). Information is another of the key flows that has caused losses and much pain for logistics and supply chain operations. Logistics management, defined as the integrative process that seeks to organise the above flows will succeed through adequate information systems. (Christopher 2016). This is a key competence that enables organisations to sustain their position in the marketplace by improving its supply chain visibility. It has been argued that because of the globalised nature of some supply chain operations, the effectiveness and efficiencies of operations have been hampered by inadequate and, at times, inaccurate documentation. In some cases, logistics and other support staff do not seem to fully appreciate the importance of information flows for planning and execution of supply chain operations. The adoption of information techologies in Africa lags behind other regions, and in most cases, information flows are still based on the manual input of data.

The idea is that supply chains are activities and/or networks of activities including organisations that are linked in the process of supply and

delivery of goods and services. In other words, a supply chain is like a pipeline through which goods or services flow from source to consumer and should allow for reverse flows of returns in all their forms. There is a need to balance the logistics network requirements with production and distribution cycles within market segments. This requires adequate information flows, a key logistics management deliverable. Logistics management requires information flows for adequate planning of key resource availability, to match the perceived customer value expectations and service level objectives. These key resources for effective supply chain operations comprise physical network resources; informational resources; staff and skills and financial resources. This means that logistics management becomes a key capability that differentiates sustainable supply chain operations.

These networks are considered important differentiators in the marketplace as organisations are now competing through supply chain capabilities (Christopher 2016). For medical and pharmaceutical products, supply chain operations are critical due to the high standards required. Unfortunately, for Africa it would appear that the supply chain concept, especially in the public sector, is not accorded the same level of importance as other strategic decisions. It has been observed that in spite of increased donor funding in this humanitarian area, weak supply chain links have made accessibility to essential medicines and patient care difficult, with catastrophic results.[4] Investigations revealed that inadequate physical infrastructure, poor products, information and financial flows were the major weaknesses in medical supply chain operations in most developing countries (Mathew et al. 2013; Riungu 2016). Effective supply chain decisions in these key areas will improve healthcare delivery, patient care and reduce the overall costs of healthcare services.

Logistics managers are expected to deliver the six "rights" mentioned earlier within these complex supply chain networks. Therefore, a sound appreciation of the supply chain network, its strengths and limitations is necessary. SCM is a term that is now common in business and academia to denote the integration of business processes, from original suppliers to end users, providing products, services and information that add value for customers. Other definitions, such as that from Ellram and Cooper (2014), provide both managerial and theoretical insights into how supply

chain activities can be integrated to ensure effective overall performance. We will look at these activities to see how logistics management can play a significant part in ensuring that the six "rights" of supply chain performance are achieved.

From the definition adopted above, we can explore the network structure of supply chain flows with a view to establish how key supply chain activities can be enhanced through a synchronised logistics management approach. Logistics management is all about designing the supply chain network that will deliver sustainable performance to meet business objectives.

In this concept of network, the supply chain includes all activities and processes to supply a product or service to the end customer or consumer (see Fig. 3.3). The key players in the processes or activities of a supply chain network would include the following:

- links with many companies;
- a number of supplier/customer relationships; and
- intermediaries such as wholesalers, warehouses and retailers.

Logistics management is considered a key part of SCM in planning, implementing and controlling the effectiveness of the flows to deliver acceptable customer service levels.

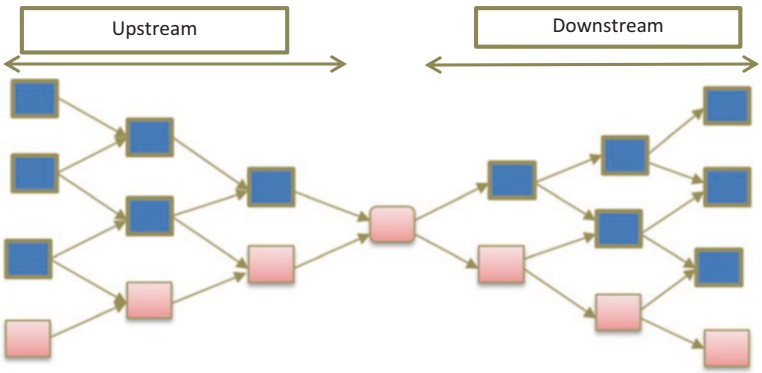

Fig. 3.3 Supply chain network. (Source: author)

3.3 Supply Chain Network and Performance Improvement

The marketplace has undergone a significant paradigm shift in recent years and logisticians in Africa can expect rapid changes within their operational environments. From a global perspective, the marketplace is a considered a consumer-pull system reflecting real-time demand, displacing the old push system. In the old push system, businesses produced goods and pushed them downstream towards a consumer. Times have changed and organisations have realised a different model of operation is necessary, one which requires more attentiveness to customer needs as opposed to flooding the market with products that may not sell. In fact, the consumer is now more empowered as a result of the prevailing global competitive environment and increased knowledge of alternative supply sources due to information availability. Supply chain networks have also expanded beyond country borders, owing to improvements in transportation and removal of restrictions on material flows across countries. Some labour-intensive industries in developed countries have seen opportunities for offshoring their operations to low-cost regions and Africa has the potential to be a location of choice for this supply chain activity. The World Trade Organisation noted that successful offshoring to low-cost regions has seen high growth rates in economic development for Asia to the exclusion of Africa. This could be attributable to the state of, or the perception of, the logistics and supply chain capabilities in Africa compared to Asia. Therefore, for Africa, supply chain competences provide the essential differentiator within a volatile competitive business environment.

3.3.1 Key Drivers for Logistics and Supply Chain Performance

What then should be an appropriate response from Africa in relation to Logistics management? The performance of logistics in Africa is variable in terms of infrastructure capacity, supply chain risks, and overal logistics performance of the six rights. While the geopolitical landscape and economic performance levels within the continent present challenges to both domestic and global operations, there is no doubt that logistics and transport are key drivers for effective performance of supply chain

operations in the region. In an Agility Emerging Market Logistics Index, 2018, Africa's biggest risk ahead of corruption, government stability and terrorism is identified as supply chain risks, mainly due to poor infrastructure and supply chain management skills. The World Bank's Logistics Performance Index (LPI) (Ojala and Çelebi 2015) identified the following attributes for modern logistics and supply chain performance:

- efficient customs and related operations;
- efficient information systems;
- effective shipment arrangements;
- logistics competence of transport operations and related logistics services;
- track and trace capabilities for shipments;
- good infrastructure and supporting network operations; and
- safe and on-time deliveries.

From this, it can be argued that logistics and transport efficiencies are inter-related with the profitability of businesses. Consider how a reduction of inventory holdings through effective logistics planning and efficiencies in information systems can lead to a lowering of total costs in supply chain operations. The capabilities of effective logistics services (logistics competence) in responding to demand variations with short lead times (LTs) provide a much need differentiation in the marketplace. For example, Kenya has surpassed other larger economies like India to become the third-largest emerging market in trade with European Union (EU). This is attributable to its supply chain improvements in air export capabilities, thereby positioning itself as a favourable logistics hub for perishable freight within the region. The key influencers for these capabilities are network design and logistics management informed decisions in the following:

- the nature of demand and market segments;
- sourcing and procurement;
- transport;
- warehousing;
- information systems; and
- skills and people issues.

3.3.1.1 Demand and Market Segment

In order to have a clear picture of the demand and market segments within Africa, a strengths, limitations, opportunities and threats (SLOT) analysis using information from McKinsey Global Institute (MGI) (2016) is shown in Fig. 3.4. The opportunities for business growth from the global business environment are dependent on the perceptions of potential investors. While there are some key strengths within the region, for example growing economies and an abundance of natural resources, there is a need to address the limitations and inherent gaps, especially with regard to logistics and supply chain infrastructure provision.

With rising household consumption and business expenditure projected in the next decade, there are strong market opportunities for logistics and supply chain operations. Growth in urbanisation is linked to higher levels of disposable income for households and an increase in

Fig. 3.4 SLOT analysis for Africa's marketplace. (Source: author)

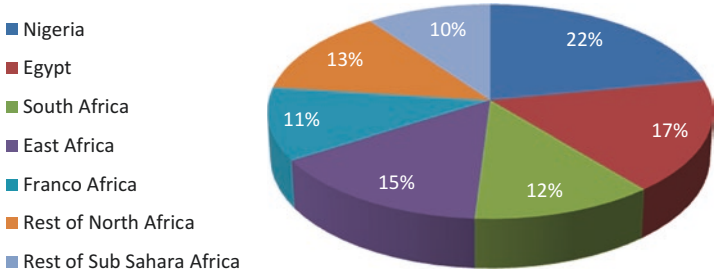

Fig. 3.5 Household consumption by 2025. (Source: author from data Oxford Economics: IHS; African Development Bank; McKinsey Global Institute analysis)

demand for consumer goods and services, for example transport services. Household consumption was USD 1.4 trillion in 2015 and is expected to grow at 3.8% a year to reach USD 2.1 trillion by 2025. Africa's consumption growth rate is second only to that of Asia (MGI 2016). Sub-Saharan Africa has a high growth rate of 79%, combining the figures of Nigeria, SA, East Africa and the rest of sub-Saharan Africa (Fig. 3.5). Projections show that for countries such as Nigeria and SA with a high household expenditure, the demand for logistics services would be higher than elsewhere on the continent. Another observation is that a notable percentage of these consumers are emerging as "affluent" consumers who will demand more than just basic goods, thereby expanding the demand variability. In all cases, the retail market segment is expected to grow with a resultant demand for responsive logistics and supply chains.

The business to business (B2B) market segment is growing in some parts of Africa, with the highest expenditure of more than 50% recorded for raw materials for production; 16% on capital equipment; and the rest on financial services, transport and telecommunications (MGI 2016). The key subsectors for B2B in sub-Saharan Africa are agriculture and agro-processing; construction; wholesaling; retail; and transport. A more detailed analysis of the market would go beyond the objective of this chapter. What this section reveals is that logistics and supply chain demand is likely to grow in response to the projections from the analysis. Earlier, we noted that logistics management is concerned with aligning operations to fit the supply chain network design. This expectation enables operations to be streamlined to avoid unnecessary bottlenecks that may arise from the prevailing business environment—remember that effective and efficient logistics and supply

chain operations remain the key differentiator within the globalised competitive environment. The logistics and supply chain planners will face these inherent gaps in their search for opportunities to enhance or improve supply chain performance.

3.3.1.2 Sourcing

Supply sources and capabilities are a key influence on the design decision for supply chain networks. For instance, the locations of suppliers and customers have an immediate impact on the size and complexity of a network. Often the effective and continuous supply of goods and services are hampered by a lack of adequate assessment and appraisal of supply sources. The result of these failings can mean that the cost of goods becomes highest component of the total supply chain cost. The need for an integrative approach at an early stage of the supply chain operation is essential. Organisations should aim to select suppliers that will align with the overall customer service objectives. The notion that suppliers are considered an extension of an organisation's business or network entails effort in the appraisal of supply sources to ensure continuity and reliability of supplies.

When negotiating with suppliers, organisations should ensure that contractual terms of supply are aligned with its supply chain strategy. Challenges arise when the bargaining power of an organisation is less than that of a supplier, especially in regions with unfavourable supply conditions like developing countries. In some of these regions, most projects are funded by national governments or bodies like the World Bank (WB) that will insist on some form of competitive bidding for the selection of suppliers. Competitive bidding and associated rules may present challenges to organisations trying to collaborate with suppliers in order to maintain long-term, sustainable relationships. Overall, the sourcing and procurement strategy should be based on an appropriate portfolio analysis that enables sourcing from those suppliers that match the criteria of the network design. This ensures that the trade-off opportunities, in volume, packaging, transportation and associated costs from network capabilities can be maximised from source activities.

3.3.1.3 Transportation

According to the African Development Bank (ADB) the cost of transport in general is considered to be high in Africa compared to other regions (ADB 2013). This is due in part to colonial history, wherein transport infrastructure in sub-Saharan Africa was designed mainly for the exploitation and exportation of raw materials for European markets (Gwilliam 2011). The current transport infrastructure, considered important for linking supply sources with exports ports, is now considered inadequate, and does not provide a complete and intensive network required by modern day supply chain operations. Railways were the dominant method of transportation then, providing much needed economies of scale for bulk loads being moved to major ports of export. Speed was a major limitation especially for passenger services.

Another limitation that can be attributable to national independence is a lack of systems integration of the continent's railway networks. This has caused supply chain impediments between countries. For instance, National Railways of Zimbabwe operated railway services to Lobatse in Botswana until the early years of Zimbabwe's independence. Thereafter, the network was split into two national railways. Another integrated railway system comprising Mali, Senegal, Côte d'Ivoire and Burkina Faso suffered similar fragmentation to the detriment of collaborative transport and logistics operations (Gwilliam 2011). Opportunities to use rail is significantly affected by the state of the railway network that exists within a country. Many countries have limited track availability, while others that have mainline tracks lack rail infrastructure to reach key locations of industrial or commercial importance. Most recently, China has invested (in partnership with some governments) in building railway transport infrastructure, mainly to access the much-needed natural resources for its domestic requirements.

Access to seaports may be scarce, road networks may be poor, and the availability of land may also prove to be troublesome to build a distribution centre (DC) in the desired locations. General legal requirements are likely to differ from one country to another. There is some road transport and environmental legislation that can affect the use of vehicles in terms of size restrictions, load restrictions and time restrictions. The key point is that inadequate transport provision will result in inefficiencies in the logistics of supply chain operations (Riungu 2016). This in turn will increase the cost of products and services to the customer within the region. Global trade

and investment may view this increased cost as a "tax" or risk of doing business with the region, making the region less competitive for foreign direct investment and international trade opportunities. A more detailed account by mode of transport will follow in next sections.

3.3.1.4 Production

The potential for Africa to enter and compete for manufacturing production against East European and Asian countries requires an effective supply structure that can be benchmarked against global standards in manufacturing processes.[5] The main opportunities for manufacturing lie in the food and beverages sectors; cement and petrochemicals; clothing; and automotive sectors. Already, North Africa has taken advantage of its proximity to European markets in the manufacturing of clothing and other related goods. There are projections that Africa is capable of doubling its manufacturing capacity provided the right business environment prevails. These sectors are highly competitive, with innovation and quality being the key differentiators (MGI 2016). For instance, materials requirement planning (MRP) systems for the continuous flow of materials and components into the production process requires removal of some of the institutional barriers to effective supply chain operations. These include reducing border-related complications for upstream operations, such as corruption and restrictive customs regulations.

While these are considered macro-environmental externalities, they are still important to supply chain design and network effectiveness and overall efficiency. On a micro level, manufacturing processes are expected to be synchronised with other supply chain operations. The key efficiencies are based on a lean philosophy, that is, producing more with less, the elimination of waste or non-value adding activities from the pipeline, while responding to the market.

3.3.1.5 Warehousing

One of the key links in supply chain operations is warehousing, although the management perception of its value is still questionable. In addition to a storage role, warehouses have assumed other value-adding activities

that include the final assembly of goods, packaging and labelling before delivery to customers.

Warehousing operations have transformed supply chain operations significantly, through numerous value-adding processes. The upstream and downstream links offer a variety of LTs with warehouses (or appropriate logistical nodes) operating as de-coupling points to balance the requirements of demand, supply and consumption. In Africa, the supply of basic commodities is subject to seasonality, and the ability to store produce in a reliable way in itself offers opportunities to businesses to maximise returns by spreading sales over time rather than being forced to sell at low prices during harvest time. National governments struggle with the ravages of drought and pestilence, and the effective use logistics and the proper storage of produce during periods of good harvest can alleviate severe shortages.

Public warehouses are usually funded from pubic money or, as in some African countries such as Zambia and Tanzania, through donor funding. In addition to the strategic storage of farm produce, these warehouses or grain silos, also act as linkages between finance institutions and suppliers, wherein suppliers are paid for deliveries into these storage facilities, with final marketing and distribution taking place at a later stage in the supply chain. Public warehouses are also required by customs, especially for imported goods, and also as government central stores for distribution and storage of medical supplies.

The other class of warehouses is private warehouses, often run and financed from private funding. These warehouses play various roles in supply chain operations, depending on the strategy the business has decided upon. As seen in Fig. 3.6, supply chain networks require warehouses for the storage of raw materials for production processes and for the storage of part-finished goods awaiting final assembly. Warehouses are also required for positioning finished goods within market segments, for example a number of manufacturing organisations such as Japanese Canon have set up distribution centres in Dubai to serve markets in the Middle East and Africa (Manners-Bell et al. 2014).

Whether public or privately funded, warehouses are crucial for effective logistics and supply chain operations. This means that key decisions regarding their purpose, number, location, design and layout requires careful consideration. Among the factors determining the location of warehouses are the state and availability of infrastructure, transport links

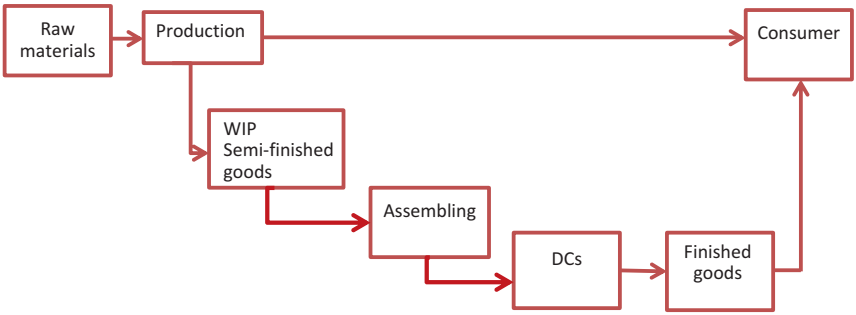

Fig. 3.6 Warehouses as part of a supply chain network. (Source: author)

and labour resources. As illustrated in Fig. 3.6, warehouses should facilitate material flows and therefore should not to be treated just as storage facilities. The requirement for storage is temporary while awaiting the next stage within the supply chain.

The environment in Africa presents challenges for warehouse operators, in terms of availability of suitable buildings, infrastructure, skills, utilities and the stability of services, especially electricity. However, recently there has been a willingness from international operators to invest in warehousing parks in Africa. For example, Agility, a leading global logistics company, has already invested in a warehousing park in Ghana and plans to make similar investments in other African countries. Of course, those countries that have a stable supply of utilities, skilled labour and satisfactory transport networks are likely to be the preferred locations of future investment in regional distribution centres for some of these global logistics companies.

3.3.1.6 Information Flows

Information is an essential flow within supply chain networks and logistics management. It has been long viewed that business strategy, organisation structures, business relationships and supply chain operations are held together by a "glue" (Evans and Wurster 2000). This "glue" is the capabilities and role that "perfect" information plays in all aspects and levels of business operations, both strategic and operational.

Supply chain networks require the information requirements for the networks to be defined, the data sources for the information and then a

design for the information systems that will facilitate logistics and SCM. Information, communication technology (ICT)—a key driver for information flows—has experienced significant growth with a large percentage of the population in Africa within reach of a GSM signal. There is also an increase in the number of people with mobile phones, although access to the internet is still limited in some parts of the continent. In research conducted by an Industrial Development Corporation (IDC) company in South Africa, it was revealed that although the adoption of digital devices for data capture is maturing within logistics and transport operations, there are still substantial opportunities for improvement. There is evidence that technological and communication advances have been made in Africa through the use of mobile phones and other social media platforms. In SA, the use of mobile phones for surfing the internet is on the rise (see Fig. 3.7). Around 39% of mobile phone owners in SA use their devices for internet use, providing opportunities for omnichannel sales and distribution.

For instance, it is reported that nearly 80% of logistics functions still use paper forms and 52% of the data is input manually. More concerning is that one-fifth of the data captured manually is not entered at all. This leaves only 28% of the data being entered either using a digital scanning process or through the use of a digital pen.

There is scope for improved information flows by adopting emerging technologies. In the SLOT analysis, one of the key opportunities for

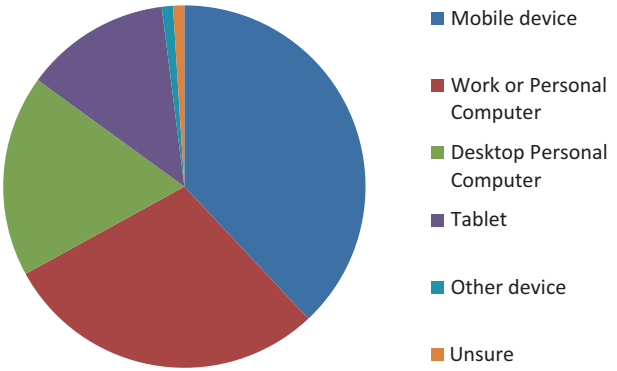

Fig. 3.7 Internet use by device in SA. (Source: author computation of data from IDC company)

Africa's economic development is in taking up technologies that prevail around the globe. The region is projected to have a faster penetration of the internet through the use of smart phones (MGI 2016). Already e-commerce is growing (particularly through the adoption of e-payment systems), with huge benefits to logistics and supply chain operations.

3.3.2 Skills Development

Having the resources (physical structures and equipment) alone without proper application and timely decision-making, will not give you the intended outcomes of supply chain operations. In this view, the key differentiator is how these competences and capabilities have been applied in the planning, co-ordination and operations of the supply chain. Organisations that design supply chain networks without the requisite skills set or competencies will face problems in delivering the key objectives of supply chain operations. From our initial supply chain flows, we have included a unique flow not usually considered in terms of the concepts of supply chain flows. In our view, skills and knowledge are important flows for effective supply chain performance. For example, it is the leadership and their teams that design and implement supply chain networks. There is a need for appropriate skills sets in supply chain network management, to be able to translate and use information in decision-making and in the execution of operations. Some organisations already have employees with these skills sets. However, for other businesses, these skills are available from logistics service providers such as Third Party Logistics (3PL) and Fourth Party Logistics (4PL). This means collaborating with other organisations that have suitable skills and competences in the supply chain network of choice. Organisations such as Kuehne and Nagel, DHL and UPS have networks of operations and infrastructure that can be tapped into, provided the selection is based on the dictates of supply chain objectives.

Strategic decisions include which markets to target. Their key attributes should be clearly defined so as to decide on appropriate supply sources, production locations, distribution systems and service levels (see Fig. 3.8). The location of nodes and links for the supply chain network

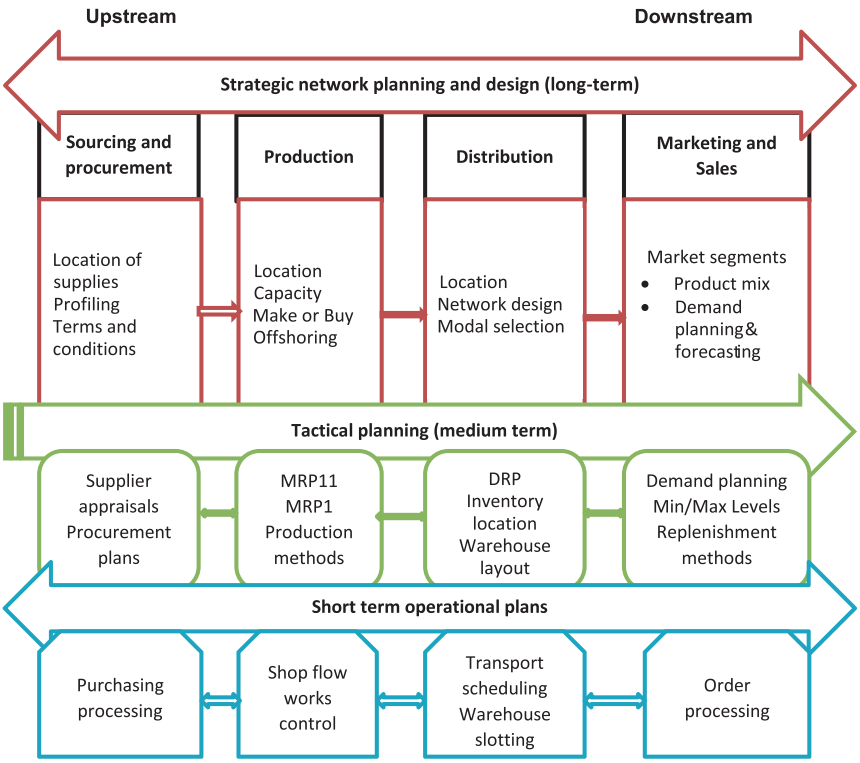

Fig. 3.8 Planning levels and key decisions

become key strategic decisions for effective and efficient logistics operations. This requires sound analytical skills being used to examine the information collected, generating options that can be evaluated to produce sustainable decisions.

Supply chain decisions are considered mainly in terms of tactics because they focus more on delivering corporate objectives. This relegation of supply chain decisions has, in most cases, militated against the effective performance of supply chain operations. For instance, one of the reasons advanced for the poor performance of medical supply chains in developing regions like Africa, is that supply chain decisions are not accorded a central role in the formulation of an overall strategy. In Kenya, a national malaria control campaign in 2009 failed because SCM was not

included in the strategy, resulting in a mismatch between demand and supply at hospitals and health centres. Product flow, information and financial flows were ineffective and mostly poor. By ensuring that supply chain planning is given a strategic role, tactical plans will translate the strategy to ensure that the necessary budgets, assets and resources are available.

In tactical planning you need a continuous appraisal of supply sources and the development of procurement plans as well as determination of production schedules through manufacturing resource plans (MRP11) and material requirement planning (MRP1). ICT is available to capture data from several sources and is also capable of manipulating data (for example, warehouse management systems and transport management systems), but the use of information depends on human resources. Strategically, managers need to be able to see the bigger picture in the design of an appropriate network for their supply chain.

3.3.3 Money Flows

Supply chain performance is often considered in terms of reduced LTs; reduction in inventory holding; improvements in planning forecasting and replenishment; responsiveness; and customer service. These are necessary key performance areas for supply chain operations. However, poor financial flows in the supply chain can negatively erode the benefits of supply chain efficiencies. Some contributors have suggested that while SCM is gaining momentum, it would appear that financial flows are still performing as they did more than three decades ago, notably with significant delays in the processing of invoices for payment, unnecessary errors and long delays in settling accounts (accounts payable (AP) and accounts receivable (AR)). Hausman (2005) noted that poor financial flows, or long cash-to-cash cycle times, have tended to increase the amount of working capital required in the supply chain network with resultant higher opportunity costs to the business. Here higher opportunity costs arise from the increased working capital requirements, money that could have been invested elsewhere.

A new wave of financial supply chain management (FSCM) is changing the landscape to increase visibility and enhance financial flows within supply chain networks and operations. For instance, technology has

enabled innovative ways of improving these money flows, through Electronic Invoice Presentment and Payment (EIPP) systems; Purchasing Cards (P-Cards); and Distribution Cards. These systems are more reliable, less costly and predictable, with a direct impact on product fulfilment rates, on-time deliveries and cash-to-cash cycle times.

Some financial controllers believe that they can improve working capital by delaying settlement of invoices from their suppliers. This traditional way of managing working capital has a negative impact on supply chain performance overall. Consider that an invoice submitted for payment is AP for your downstream supply chain operations, while at the same time it is an AR for upstream operations. In effect, the negative impacts of the flows will affect the end customer who will have to bear the cost in the final analysis. Logistics and supply chain partners have an important part to play in facilitating money flows within the network. This includes:

- processing invoices, that is, checking deliveries against purchase orders (POs), usually at receiving points or warehouses;
- timely submission of documentation to support payments, for example proof of deliveries (PODs);
- minimising errors in computations and calculations;
- reducing pick errors, damages;
- improving information exchange between upstream and downstream operations, reduces holding of unnecessary inventories; and
- introducing effective replenishment methods to avoid costly expediting of replenishments.

Improvements in supply chain design will positively enhance financial flows in several ways including a reduction in inventory holding. Improved financial flows will have a positive impact on supply chain performance.

3.3.4 Distribution

Decisions relating to distributions of goods are central to sustainable supply chain operations as these decisions impact on the direct interfaces between the organisation and its customers. Chopra (2016) stated that

distribution is a key driver of the overall profitability of a firm because it directly impacts both the supply chain cost and the customer experience. In this case, a cost-effective distribution strategy starts with establishing the customers' needs or requirements and the costs of meeting those needs. Organisations can distribute their products directly from production to the end customer, or through retailers, and in some cases through a multi-channel distribution network. Supply chain networks used as case studies for the two distribution models are Dell computers and HP, where the former distributes directly to customers and the latter uses retailers. Another example of direct distribution is fresh farm produce that can be distributed directly from the farm to customers or retail outlets. The third group comprises parties involved in the distribution of products and these could be intensive, selective or exclusive distribution channels.

With intensive distribution channels, suppliers use many retailers to reach the market, for example every point where customers are likely to access products, such as fuelling points, supermarkets and grocery stores. Fast-moving consumer goods (FMCG) uses multi-channel networks in order to meet the volume required and achieve sustainable profit margins. Through selective channels, suppliers choose retailers or channels based on geographical locations that will provide an extra service level according to the market segment for the product. Industrial products and the automotive industry have used this channel mainly because those products have quality standards (for example medical supplies) or an after sales back-up service is required for the life of the product. Exclusive channels are used when retailers want to protect a brand image in niche markets such as watches and luxury cars. For example, there is only one distributor and seller of Mercedes Benz vehicles in Namibia. This distributor has an exclusive dealership for this particular product in Namibia.

In all cases the key attributes of a sustainable and responsive distribution network strategy seek to balance supply chain costs with a customer service level. The responsiveness and customer service levels of a distribution network in general are influenced by the following factors:

- market segment and size;
- lead times;
- products availability;

- customer experience;
- product variety; and
- returnability.

The market segment and size of an order will influence the decision on network design in terms of number and location of distribution centres. Lead time (LT) is the time between identification of a need or receipt of an order and the time that the need is satisfied or delivery. In addition to transportation LT, there are a number of other activities that take place within the distribution network that will also influence the total LT. Product availability depends on the distribution network setting up acceptable stockholding levels within strategic locations. This raises another problem associated with supply chain inventory holding, that is, the "bullwhip effect" or "Forrester Effect" that increases supply chain stockholding and total costs. Supply chain network design would not be complete without consideration and provision of the return loop in the form of returns of unwanted goods, reworks and other waste resulting from operations.

3.4 Infrastructure Availability and Capacity Utilisations

Manner-Bell et al. (2014) reported that economic development in Africa has been negatively impacted by the following factors:

- weakness in transport and related logistics operations;
- invisible and indirect costs, such as customs delays;
- high transportation costs for global supply chains starting or ending in Africa;
- geographical challenges due to a low ratio of road network per square kilometre; and
- scattered populations with long distances between urban centres.

In addition, Africa has a greater number of landlocked countries than any other continent (Table 3.1).

Table 3.1 Landlocked countries per continent

Continent	No. of landlocked countries
Africa	17
Europe	13
Asia	12
South America	2
North America	0
Australia	0

Source: author

The fact that 17 out of 44 countries in Africa are landlocked, coupled with poor road networks, makes air transport very important in global supply chain operations.[6] This view is also supported by Schlumberger (2010), which noted that in spite of this potential for growth and economic development in air transport, there is still scope for more participation from this industry in facilitating flow of goods and service across the supply chain pipeline.

3.4.1 Logistics Network Design

Once a firm chooses a mode of transport it can then decide on the logistics network design, which has a major influence on customer satisfaction. Considering the characteristics of products being moved, the network design needs to ensure that the handling of these goods is timely (for example perishables need the shortest LT possible). When these goods arrive at their destination, they must be unloaded with minimal delay and, if required, stored in temperature-controlled rooms to await the next movement.

Perishable items such as flowers from a farm in Kenya (currently leading flower exports in Africa) are transported by road to Jomo Kenyata airport through either Amsterdam or Dubai for delivery to the marketplace. These flowers are offloaded from the aircraft and stored in temperature-controlled transit rooms and then cross-docked to 3PL, to the distributor/retailer and then the end customer (Fig. 3.9). This particular logistics network design for perishable items is one that has a very short LT. As noted within this market sector, flowers that are distributed

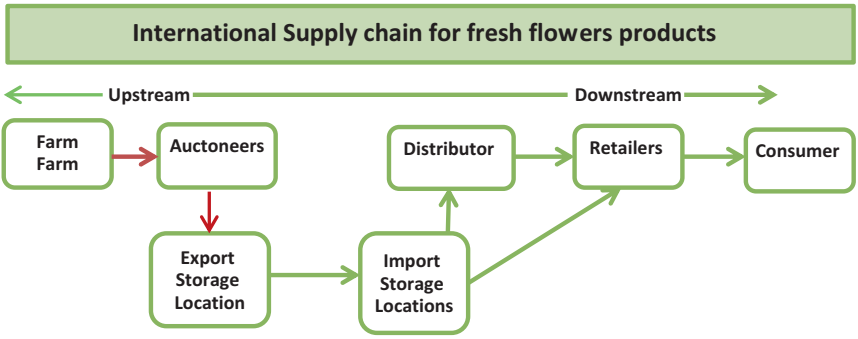

Fig. 3.9 International supply chain for flower products

directly from farm to markets are of better quality than those that have a longer distribution channel. The challenge for this supply chain is to find a network that can support the market demands for quality fresh flowers, minimising handling and time to market.

The network design also involves multi-modal transport using temperature-controlled lorries. Dubai airport's logistics department is continuously looking for new ways to reduce touch-points and LTs.

3.5 Supply Chain Network Challenges in Africa

While the increase in GDP rates for most of the sub-Saharan region can be attributed to natural resources (more closely related to the exportation of raw materials to global manufacturing locations), Africa's demand for semi-processed, processed and high-value foods (many of which are considered basic food staples) is rising rapidly (Traub et al. 2015). This demand is increasingly being met by world markets, with OECD-FAO projecting that the region's growing demand for food products up to 2033 will be met by imports from global markets. This would imply an increase in distribution activities for FMCG.

While informal traders still dominate much of the retail landscape, there is evidence to suggest that an increase in middle income holders

within some of the countries will spur growth of formal retailing through shopping malls and large supermarkets. Kearney (2014) noted the low growth in this formal retail sector as an opportunity for supply chain operations. The key players on the scene include Shoprites in Southern Africa, Carrefour in Western Africa and Nakumatt in East Africa. As this retail opportunity presents itself, logistics and supply chain capabilities should prepare for a corresponding increase in demand for their services.

While it is an acceptable economic fact that the demand for transport and logistics services is a "derived" demand (Rodrigue et al. 2016), efficient logistics and supply chain operations can also have a catalytic effect, becoming a key enabler for successful growth in retail initiatives. Designing quick-response supply chain operations (Christopher 2016; Rushton et al. 2014) will become essential. Information sharing between demand and order fulfilment, through efficient replenishment systems and effective deliveries are key performance areas for effective logistics and supply chain operations.

In order to compete for inclusion in global supply chains, African countries and others have to address institutional barriers to international business, such as excessive bureaucracy, customs procedures, laws, finance and personal security, and improve basic infrastructure. This operational risk is really important in developing and emerging countries. For example, India has one the world's fastest growing economies but supply chain challenges remain due to the poor infrastructure. It has a complex tax infrastructure, weak distribution system, fragmented market and lack of technology. India has the second largest road network in the world, totalling 4.2 million kilometres; most of it is of poor quality. Due to the country's weak distribution network, many retailers maintain high levels of inventory. Retailers will need to invest in innovation systems and skills development as well as maximise linkages to commodity exports.

3.5.1 Modes of Movement

In general, transportation systems in sub-Saharan Africa are considered poor in comparison to those in developed economies like Europe and the

USA. The main reasons for this poor state of the transportation system range from inadequate investments in infrastructure, under-utilisation of existing systems and lack of management and operational skills. Logistics and transport systems play a pivotal role in successful supply chain operations. A major barrier to economic development is the limited access to consumer markets and restricted capacity. However southern African infrastructure is considered to be better developed than in West and East Africa. The main aspects here reflect the volumes to be moved and stored, where and when. The movement modes attract a range of potential unit costs and we examine them in greater detail here.

Sea

While around 90% of Africa's international trade is by sea, it is reported that lack of infrastructure and port delays are a major concern for logistics and supply chain operations. It is generally accepted that movement of freight by sea achieves lower unit costs and all goods can be taken. However, slower delivery speeds have increase supply chain LTs.

Due to the landlocked nature of many of the countries in Africa, it has been demonstrated that up to 50% of the supply chain LTs in and out of Africa is spent in ports, mainly African ports. This increased transport time impacts negatively on trade and economic development (Kgare et al. 2011). However, it is still argued that sea fright is effective over longer distances and therefore sea transport plays a pivotal role in global supply chains in Africa.

Raballand et al., (2012) report that shipping a container from Africa takes twice as long as getting one out of India and about six times as long as from a US port. However, there is evidence of new investment in the maritime sector in Africa. For example, inefficiencies and delays at Cameroon's Douala port has resulted in the country deciding to invest in a new port at Kribi, earmarked to be the only deep seaport in central Africa.[7] Upgrades in Mombasa port and the construction of new ports at Lamu and at Bagamoyo north of Dar es Salaam are aimed at improving available capacity and efficiencies needed in this East Africa gateway.

In an effort to improve port performance at one of its major ports in Durban, SA has made big strides in ensuring that Durban port becomes

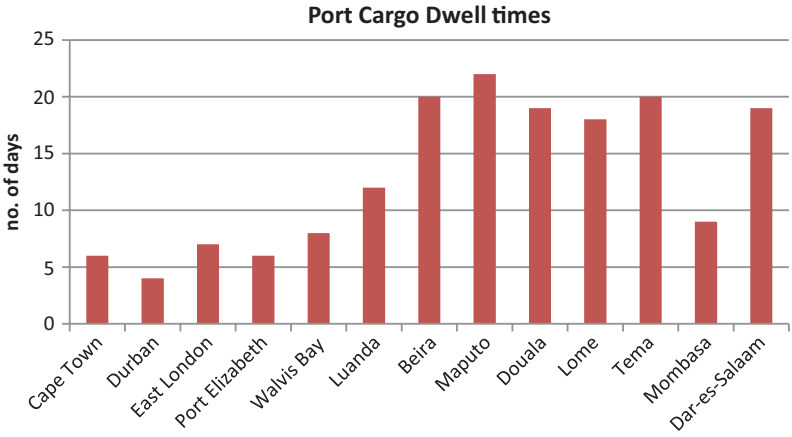

Fig. 3.10 Port cargo dwell time. (Source: author from computation of data from Kgare et al. (2011))

the benchmark not only for southern African ports but also sub-Saharan ports (Fig. 3.10). Collaboration between key stakeholders in public sectors involving customs, port authorities and the private sector (shipping lines, freight forwarders and customs brokers) resulted in a reduction of cargo dwell time in Durban (Kgare et al. 2011)

The approach that Durban port authorities took to manage the cargo dwell time was to split times into specific components, for example operational, transactional and discretionary times.[8] This enabled to port authorities to identify and reign in the key players who contributed to dwell time, providing incentives and enforcement to reduce and manage port operational flows. A pricing strategy was also applied with the same view of encouraging speedy transactional processes and discharge of goods to reduce congestion and bottlenecks within storage facilities.

Rail

Railway transport is considered attractive regarding unit cost against other modes of transport and can transport all goods. However it has limitations in routes, timings and cargo safety. Today, it is being used more and more for continental and national freight movement. In

Africa, railway transport has been used mainly for freight movements and is currently experiencing stiff competition from road transport. Rail freight movements reflect typical natural resources and economic structures in different countries, for example minerals movement in Zambia, Ghana and SA; and grain, coffee and cotton in southern and West African countries. There is also intra-regional and international container traffic that can best be moved through railways, with opportunities for inter-modal freight operations. Large organisations have embarked on strategies to increase the proportion of rail movements within the next three years.

However, SA uses its railways heavily for commuter passenger services, which accounts for more than 70% of the region's railway passenger traffic. In some cases, rail transport is used to carry both passengers and freight. For example, at one time National Railways of Zimbabwe (NRZ) had efficient mixed-train services wherein passenger trains also provided a mail service. In his survey on Africa's network infrastructure, Gwilliam (2011) noted that on average rail haulage in Africa is relatively long in the context of overall network size, however not as long as that of road transport. This would signify why road transport appears to be the main challenge to rail for transporting freight. One weakness of rail transport has been its inability to offer door to door. However, some railways predominantly carry traffic from one end of the system to the other but are limited to terminal to terminal points.[9] There are several other reasons cited for a loss of market to road transport, including:

- a lack of a door to door service within certain market segments;
- the negative impact of natural disasters, for example cyclone disruption to railway infrastructure in Mozambique and Tanzania;
- the effect of civil war on rail operations, for example in the Democratic Republic of Congo and Mozambique;
- a limited investment in new railway stock, such as locomotives and wagons;
- poor maintenance of infrastructure and rolling stock;
- a lack of management and operational skills;

- poor quality of service in terms of LTs, reliability, safety and security; and
- political interference in the management of railways due to the nationalised nature of railway operations in most of African countries.

In spite of these challenges, railways have a key role to play in supply chain networks in Africa. For example, bulk and semi-bulk traffic are most suitable for railway transportation especially to and from ports.

Air

Air movement has increased significantly over the past decade, which would appear to be contradictory with the need to reduce costs. The disadvantages of air transport include the high cost of transporting products. Due to the limited capacity of aeroplanes, air transport is not suitable for transporting bulky products compared to other modes such as sea, rail and road. However, it is the fastest mode of transport and has no physical barriers compared with other transport modes. Political boundaries are also immaterial as long as legal requirements are observed and international laws are followed.

However, some of these advantages are not fully realised in Africa. For example, while it is accepted that air transport remains critical to Africa's network integration and for global supply chain operations, inadequate airport infrastructure and unsatisfactory performances of many national air transport operators presents major problems for shippers (Gwilliam 2011). However, compared to other transport modes, air transport has the supreme advantage of speed. Although it is accepted as a higher unit cost mode, air transport offers a rapid transit of goods (though not all goods can be transported by air as there are restrictions on hazardous materials).

Within Africa, air transport is considered as making a great contribution to regional and economic development. Air transport has the potential to open up global markets by connecting Africa with the rest of the world through the key flows of supply chain operations. Agricultural produce can be moved to global markets with short LTs, as is the case with

beef products from Namibia and fresh flowers from SA and Kenya. Investments in air transport will enhance the opportunities for manufacturing industries to locate to the region because just-in-time supply chain principles can become possible, making Africa another location for offshoring of production for some organisations. Investments in air transport facilities improve connectivity between countries and their respective international trade partners and increase economic development. However, few airports have direct international links but some, like Johannesburg and Cape Town in SA, Nairobi in Kenya, Cairo in Egypt, Lagos in Nigeria, Addis Abba in Ethiopia, and Accra in Ghana, have earned the status of regional hubs connecting Africa with the rest of the globe.

There are immense opportunities in the growth of air transport in global supply chains for Africa (Schlumberger 2010). These include trade-offs between movement unit costs, inventory costs and service LT commitments. With the current cost models it would appear to be beneficial to reduce inventory and operate a much faster response system (quick response (QR)). The opportunities for physical integration of the continent against the inadequacies and weaknesses of other modes of transport make air transport a vital link in the supply chain network in Africa. While there has been a significant increase in air traffic over the last decade (CAPA 2013; Njoya 2016), it has been noted that up to 80% of inter-continental traffic between Africa and the rest of the world is operated by non-African airlines (Chingosho 2013).

There are opportunities for African airlines to play a significant part in this growth area, given that air transport in Africa is expected to grow by 5.7% per year, which is greater than the world average of 4.9% (Schlumberger 2010). The Yamoussoukro Decision on an open skies policy that came into effect in 2009 encourages greater participation of continental airlines in this growth area, although it focuses more on intra-Africa air transport (Schlumberger 2010). SA has a different air transport network, which is experiencing significant growth estimated at 30% by 2030 (Mannes-Bell et al. 2014)

Road

Road transport is the most important mode of travel within most countries. In the context of international logistics and distribution, road

transport is also important, even where there are significant geographic limitations. It is accepted as being flexible for all goods and has a wide range of unit costs: usually costing more than rail and sea but less expensive than air transport. Road is effective over shorter distances particularly the "final mile to the consumer". Sea, rail and air need road transport to service the fixed entry and exit points within their networks.

In order for road freight transport to provide a fast and effective logistics service, it is essential that infrastructure comprising of roads network and associated transhipment points are adequately available. This will enable appropriate planning for logistics operations that will balance service levels with costs. Schedules can be worked into route planning and it can be highly competitive from a cost viewpoint. For example, trunking services or primary transport movements involves large capacity vehicles making, thereby reducing the unit freight costs. There is a reduced double handling for direct, full load deliveries. This freight operation also saves transit times and minimises the likelihood of freight damages. Packaging costs can be kept low because loads are less prone to excessive movement in transit compared with other transport modes. However, road freight transport is vulnerable to time delays, especially where the network is poor and inadequate. This combined with the lower speed can be deemed as disadvantageous. For example, the road access rate in Africa is recorded as only 34%, compared with 50% in other parts of the developing world, and transport costs are therefore higher by up to 100% (AfDB PIDA 2013).

The realisation of a "trans-Africa road" network has been on the drawing board for some time now. The idea was mooted, around 1890, in Cecil John Rhodes' vision of the Cape to Cairo rail linkage. More recently there is evidence of political will to tackle logistics and transport network problems in order to realise the benefits from trade and resultant economic development for Africa Through initiatives such as Programme for Infrastructure Development in Africa (PIDA), the region aims to set the agenda for strategic infrastructure projects aligned with Africa's long-term goals and highlights the importance of regional infrastructure for Africa's growth.[10] This should see the creation of major road networks linking the rest of the continent with major economies and ports. For

example, key transport nodes can be connected by major highway road networks:

- Dakar (Senegal) to Cairo (Egypt) highway
- Algiers (Algeria) to Lagos (Nigeria) highway
- Tripoli (Libya) to Windhoek (Namibia) highway
- Cairo (Egypt) to Gaborone (Botswana) highway
- Dakar (Senegal) to Ndjamena (Chad) highway
- Ndjamena (Chad) to Djibouti (Djibouti) highway
- Dakar (Senegal) to Lagos (Nigeria) highway
- Lagos (Nigeria) to Mombasa (Kenya) highway
- Beira (Mozambique) to Lobito (Angola) highway.

Some of these cities are linked by road networks that are in too poor a condition to achieve smooth flows of goods and services. This, coupled with border delays and processes, will further inhibit sustainable economic growth for the region. The above highway development projects are estimated to create 56,683 kilometres of road networks (Manners-Bell et al. 2014) and when successfully completed to full operational state, should provide much needed inter-connectivity for Africa's regional supply chain operations.[11] Some form of private–public partnership may be appropriate for this scale of investment and capital expenditure, as current financial capacities at national levels may show a shortfall. The immediate plan for governments in Africa is to ensure that existing road networks are maintained at acceptable levels, rather than wait until the network has collapsed entirely, requiring even more resources.[12]

Inter-Modal Transport

Network providers and shippers in Africa should now consider the opportunities for inter-modal freight in order to make optimum use of current resources and gain from reduced costs for their supply chain operations. There is evidence to suggest that inter-modal freight movement is the way forward. So far, evidence suggests that there is a higher growth rate in freight movement by road with that of rail transport being in decline. This is not good news from socio-political and economic perspectives as railways are considered to be a more sustainable mode of transport over

long distances. Globally there is increasing stakeholder pressure to bring back traffic to rail transport from a sustainability perspective. From a corporate social responsibility (CSR) viewpoint, carbon emissions, energy use and climate change are big issues for most organisations, driving essential strategic choices for businesses and governments alike (Bvepfepfe et al. 2006; Bvepfepfe 2015). The challenge is to have suitable network infrastructure and terminal handling systems that address these issues.

The inter-modal standards form an essential aspect of designing a supply chain network that includes modes of movement, inter-modal points and storage units, for example containers, pallets and boxes. Containers fit onto trains and road vehicles, with associated and compatible interlock onto ships.

Containers can transfer from sea to road and rail using port-based cranes to facilitate swift movement and the container remains unopened for the whole journey. Air cargo has its own specialised container to fit the cargo bay of an aircraft using hydro-roll floors to facilitate easy movement onto and off and within the cargo hold. Palletisation has evolved into a global standard process, ensuring that pallets fit efficiently into storage facilities throughout a network.

3.5.1.1 Collaboration in Supply Chain Operations

It is reported that Botswana's USD 6 million dry port was unveiled in neighbouring Namibia's Walvis Bay. Construction on the Botswana dry port, which is being run by the state-owned Botswana Railway (BR), started two years ago. Operations will complement the construction of the 1500 km trans-Kalahari railway. This new rail will connect Botswana's Mmamabula coalfield with Namibia's ports. The dry port will enable landlocked Botswana to facilitate and handle its cargo through Namport. The 36,200 square metre Botswana dry port will offer facilities such as cartage services, container handling, stacking and storage. It will act as a break bulk terminal, a general purpose warehouse and empty container park and offer value-added services such as customs clearance (source: African Business News).

3.5.1.2 Supply Chain Risk Management

Political
Independence from political setups in most sub-Saharan countries resulted in the withdrawal of much needed skills and investment from former colonial powers. For example, when France was expelled from Guinea, it reacted by withdrawing all resources and support from the country (Gwilliam 2011). Zimbabwe's land reform programme resulted in similar reactions from major financial institutions aligned to former colonial powers. The net effect of changes like these was that some major transportation projects were abandoned uncompleted, and no new investments have been forthcoming for much needed rehabilitation and expansion of the network.

Prior to developing and deploying international supply chain strategies it is essential to understand the region's stance in corporate social responsibility (CSR) issues. For example, business ethics, human rights and corruption are key influences in terms of foreign direct investment decisions. Lack of political willingness in these areas from respective governments is likely to raise the level of supply chain risks for the region (Bvepfepfe 2017). However as argued, organisations that embed these ethics into businesses can benefit their public image and help stamp out negative behaviour. Engaging in CSR and having policies in place to prevent slavery conditions in the supply chain operations, lower carbon footprints and promote sustainable and ethical sourcing can mitigate legal and reputational risk (Bvepfepfe 2015). CSR has an increased focus in business today and many large multi-national organisations have CSR policies and codes of conduct to ensure legal compliance and as a licence to operate within local communities.

Operational Risk
To operate to international supply chain standards, companies need to ensure that they have completed the right paper work and follow the strict regulations set by the customs of the country they are transferring products to. It is important to do this in order to avoid products being held at a border, causing a shipment delay. Delays can negatively raise the

risk of DC availability, shelf availability and ultimately affecting customers who want to buy the product. To resolve this, it is important for supply chain logisticians and legal compliance teams to share customs information while setting the vendors in the system. This will allow a smooth flow of goods and services in an international supply chain.

3.5.1.3 Sustainability of Supply Chain Operations

Sustainable logistics and supply chain operation are essential for economic growth and development in Africa. In terms of infrastructure provision, there are immense opportunities for developing effective and efficient logistics and SCM in Africa. Collaboration between the private and public sector in the management of operations and provision of essential network resources will go a long way towards sustainability of supply chain operations.

There is evidence to suggest that investments in transport infrastructure can enhance opportunities for supply chain network design, resulting in improvements in customer service and economic growth (Fig. 3.11).

Supply chain network design requires careful selection of the key linkages that facilitate the smooth flows of goods and services with minimal

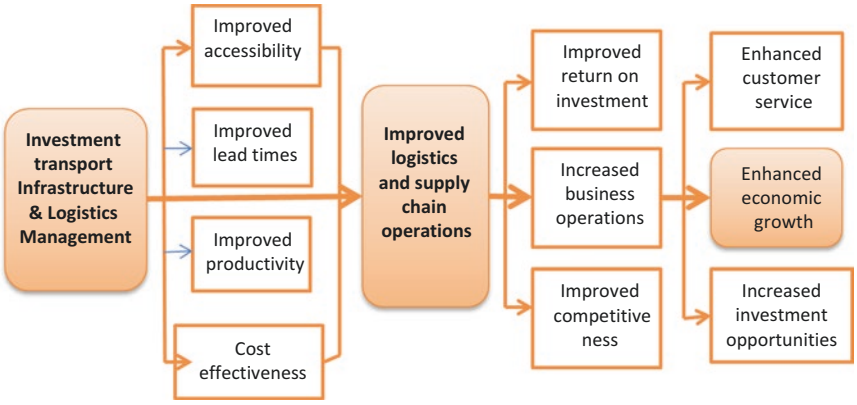

Fig. 3.11 Links between investments in transport infrastructure with economic growth. (Source: author)

disruptions and with the least cost to end customers. Logistics management is about seeing the bigger picture, opportunities and threats within an operational environment in relation to the key activities of the supply chain. Decisions are sustainable if they are made after careful analysis of information in relation to the markets, transport infrastructure, the nature, origin, destination, distance and the possibility of movements to be realised.

3.6 Conclusion

There is a need for sustainable supply chain networks in sub-Saharan Africa in order to deliver a good level of service from a logistics management perspective. The region has great potential for both investment opportunities and economic development. Several factors are influential in providing Africa with a comparative advantage, due to its rapid growth in GDP over other regions, its abundance in natural resources like minerals, thereby enabling the region to benefit from the globalised supply chain operations. However government policy, commitment and investor confidence are a key factor in making Africa an attractive value chain location for supply chain and logistics operations.

Nonetheless, supply chain managers making the right decisions, informed by a sound appreciation of the logistics and supply chain demands of their marketplace should facilitate this comparative advantage for Africa as a key value chain location in global supply chain operations.

Earlier in the discussion, it was noted that from the 1970s, several firms in Japan offshored unskilled labour-intensive manufacturing to South Korea, Chinese Taipei, Hong Kong and Singapore. In recent years these countries have become global supply chain hubs, offering gateways to international freight movements into developed countries. It is argued that for Africa, investments in efficient and effective logistics and transport networks will provide this much needed comparative advantage, thereby stimulating economic development and improving growth rates. There is scope for sustainable supply chain operations through effective logistics management in network design through continuous search for synergies and associated trade-offs within the pipeline.

Notes

1. China is a major importer of coffee from Uganda; wine from SA, olive oil from Tunisia and tobacco from Zimbabwe. However the FT (December 2015) reported a contraction of Chinese imports from Africa, although the exports to the same region show an increasing trend during the same period.
2. Sub-Saharan Africa has experienced impressive and sustained economic growth and development. Some of that growth is powered by natural resources and policies that are opening up more markets and attracting investments (Canning et al. 2015).
3. Southern Africa countries suitable for livestock raising include SA, Namibia, Botswana, Zambia and Zimbabwe.
4. For example, the national malaria strategy for Kenya lacked a supply chain component until it was reviewed in 2009. This limitation resulted in ineffective supplies and poor accessibility to essential drugs for the programme (Riungu 2016).
5. "Manufacturing is a vital engine of economic development, but Africa's economies overall have under-performed. As Africa's economies have grown and diversified over the past two decades, there has been a steady increase in manufacturing output—indeed, a rapid increase in Ethiopia and Tanzania, in particular" (MGI 2016). MGI projects that manufacturing capacity in Africa is likely to double by 2015 resulting in demand for logistics and supply chain operational activities.
6. "In 2010, the aviation industry in Africa supported about 7 million jobs, including 257,000 direct jobs, which were worth about US$67.8 billion of the continent's GDP. 57 Air transport plays a critical role in facilitating healthcare access, humanitarian assistance, the movement of products to global markets, tourism, and the creation of businesses" (Schlumberger 2010).
7. The new port of Kribi, 150 km south of Douala, will effectively replace the latter as the country's principal port, and with a 16 metre draught, it will be capable of handling vessels of up to 100,000 tonnes (Kgare et al. 2011).
8. Operational dwell time is mainly the time to unload vessels and store goods in yards. It mainly depends on the efficiency of the port and the availability of equipment combined with the level of occupancy of the storage facilities. Transactional dwell time mainly concerns the transac-

tion time between the importers/port services and customs. Discretionary storage is the residual after having taken into account operational and transactional dwell times (Kgare et al. 2011).

9. For example, TRC, Tazara, and Transrail carry freight an average of 1000 km. On the other hand, some smaller railways—such as the Mozambique and Uganda lines—feed freight to other railways, which subsequently carry traffic a few hundred kilometres further (Gwilliam 2011).
10. According to a PIDA report, "Africa's continental infrastructure investment needs as defined in PIDA are estimated at US$360 billion up to the year 2040. Of these, priority investments up to the year 2020 comprise 51 projects and programs defined in the PIDA Priority Action Plan (PIDA PAP) comprising projects in Energy, Transport, ICT and Transboundary Water at an investment cost of US$67.9 billion" (ADB PIDA 2013).
11. The project is developed as a collaboration between the United Nations Economic Commission for Arica (UNECA), the African Development Bank (ADB) and the African Union (AU) to promote trade and alleviate poverty in Africa.
12. The World Bank's *World Development 1994* estimated that, "timely maintenance of $12 billion would have saved road reconstruction costs of $45 billion in Africa in the past decade" (Easterly 2001).

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4

Freight Transport Technology: A Cost-Effective/Time-Efficient Solution to Sub-Saharan Africa's Logistics Problems

David Burl

4.1 Introduction

Centring on land transport, and focusing primarily on road freight, Africa's key freight transport problems may be stated as follows: overloaded vehicles (per operating trip); under-utilised vehicles (per operating period); use of older vehicles; delayed vehicles at transit points (e.g., inland depots and ports); poorly trained vehicle operatives; low-quality local/intra-regional road networks; and high road freight transport prices. Inter-modal containerisation, via a process of freight unit standardisation, could contribute to the solution of many of these problems. For example, a standard (10 or 20 ft) container could be filled with a set quantity of standard plastic crates; this could result in high "unit load device" utilisation, and prevent vehicle overloading (as containers are normally weighed before being loaded onto sea transport). Even oligopolistic pricing policies could be partially counteracted via the standardisation of the freight unit (and its component subunits) as it would result in

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more systematic and transparent tariff structures.[1] All-terrain adaptations to road freight vehicles (e.g., tyres) could partially overcome a generally low-quality transport infrastructure (especially permanent ways). The alternative "route technology" development (which could, for example, promote the purchase of newer, more modern vehicles) has several disadvantages as an investment priority. Specifically, it is astronomically expensive—with a "time-lagged" return on investment. Furthermore, it is politically problematic and subject to a protracted, complex multi-agency decision-making process. In the short to medium term, better vehicles beat better roads every time.

Sub-Saharan Africa (SSA) reportedly possesses the least developed road transport infrastructure in the world per unit area (Runji 2015). For a range of geopolitical and socio-cultural reasons it has not experienced the economic impetus of other global regions (e.g., Southeast Asia), which operates as a stimulus to transport technology development (De Bod and Havenga 2010).

The absence of a paved road network (permanent ways) has retarded economic development because of its negative effect on delivery lead times. Although this was the case for historic, what could be termed "low monitor" distribution systems, it has been exacerbated by the radical developments in information management (facilitated by information and communications technology (ICT) advances), notably just-in-time techniques (e.g., Hay 1988), which could be termed "high monitor" distribution systems. These were conceptualised in the USA but operationalised in Japan (notably by the Toyota Motor Corporation). These exacting logistics criteria cannot be satisfied in a freight transport environment exemplified by the two to three month transit time from a central, landlocked SSA country to the relevant coastal port. This lamentable schedule results from a combination of transport vehicle technology; transport infrastructure technology; and regulatory regime. This chapter focuses on the first of these contributory factors (e.g., Amjadi and Yeats 1995).

Evidently, in the long-term, these transport technology requirements could be solved by adequate investment, but this is impeded by a classic "cause-effect sequence" problem. Besides the fundamental question of local and regional resource bases (what products a given area is capable of supplying), logistical efficiency is a major determinant of areal trade vol-

umes and order levels. Essentially, where distribution systems are inefficient, trade volumes will be relatively low and transport technology investment limited. But that investment is a precondition for increased trade flows, requiring a positive form of speculative investment—in a word, "vision"—(see Havenga 2010).

The focus of this chapter is on transport vehicles as opposed to transport infrastructure, technology, although there is some consideration of distribution centres—for example, inland container depots. The solutions proposed are technological, but it is critical to recognise underlying socio-cultural dynamics. For example, the issue of vehicle overloading may be resolved technically, but it is also the product of endemic short-termism associated with a culture of uncertainty. This in turn is a consequence of environmental instability, associated with limited political, institutional and organisational development requiring the complex, long-term process of capacity building (Eade 1997).

It important to note that transport technology has both soft (i.e., informational) and hard (i.e., material) dimensions. Problems associated with both dimensions are evaluated, and solutions explored in the subsequent sections of this chapter. Although the discussion that follows may not provide definitive solutions to the problems identified, it will, we hope, stimulate reflection, which will lead to operationalisable remedial action.

Sub-Saharan African road freight transport is typified by the image of a vehicle that is out-dated, non-specialised and overloaded. These transport technology deficiencies have major consequences for cost, efficiency and reputation for the relevant transport operators (Naude and Matthee (2007). Technologies are available at a cost that is moderate relative to less developed country development projects. However, such projects can be relatively low profile and the associated technologies and benefits only really apparent to specialists—theorists and practitioners. The key problems are related to terrain and materials handling. In terms of terrain, the principal deficiency is that smooth terrain vehicles appropriate for paved routes are imported from advanced industrial countries and utilised on unmade routes requiring rough terrain vehicles. Inevitably, vehicle breakdowns occur that reduce efficiency, increase costs and impair transport operators reputations. In relation to materials handling, the efficiency, cost and reputational damage are less obvious, but are nonetheless signifi-

cant. The fundamental problem is that both the freight unit (bale, crate, carton, case, bulk, etc.) and the transport unit (flatbed, van body, bulk tipper, etc.) are non-specialised and non-standard. These factors result in a mismatch between vehicle and cargo that, again, negatively impacts efficiency, cost and reputation. Solutions to these problems are, arguably, impeded by a perceptual disconnect between First World and Third World conceptions of appropriate operational standards. Significant improvement in practitioner practices is dependent on the mutual recognition of industry standards that transcend economic and socio-cultural barriers (see Wigan et al. 2000). The structure of this chapter is as follows. Section 4.1 comprises an introduction. Section 4.2 classifies routes/road networks in terms of two dimensions: route type (origin/destination points); and route status (route quality). Section 4.3 is concerned with the classification of road freight vehicles in terms of body type and cargo capacity. Section 4.4 examines load type (break-bulk/bulk, etc.) Section 4.5 discusses the realisation of road freight transport efficiency via an effective combination of the factors presented in Sects. 4.2, 4.3 and 4.4 (viz. route type/status; vehicle type/capacity, etc.). Section 4.6 considers the issue of terrain/route factors and their technological implications. Section 4.7 attempts to exemplify the optimisation of efficiency via the effective combination of trip and transport technology. Section 4.8 evaluates a number of organisational issues related to road freight transport, including the function of cargo hubs, rationalising logistics administration and so on. These are soft systems initiatives designed to solve the problems delineated in this chapter and to significantly ameliorate road freight transport provision in the sub-Saharan African environment. Section 4.9 contains concluding remarks.

4.2 General Characteristics of Sub-Saharan African Road Networks

Route quality in SSA is typified by the statistic that only 33% of rural inhabitants live within 2 km of an all-weather road (Ali et al. 2015). This has significant implications for the cost scale and time scale of inbound

and outbound logistics, which are the focus of this chapter. Substantial improvements have been made to the trunk components of the network, which is partly financed by Chinese foreign investment (Foster 2009) and incentivised by access to raw material resources.

The absence of advanced industrial country institutional development in the SSA context has impacted seriously on transport planning (especially route planning) functions. Runji (2015) emphasises the importance of this capacity building. The result has been ad hoc route development serving, for example, local agricultural or national commercial interests (typically servicing the primary sector/extractive industry). A major consequence has been the absence of systematic route integration. Africa Transport Policy Program (a major multi-national transport development agency) emphasises the criticality of realising integration and connectivity in a given transport network. Brushett (2005) provides a broad perspective on African road transport infrastructure.

National geopolitical interests have retarded the development of international corridors, and sub-national (tribal) geopolitics has acted as a brake on intra-national and local route development. The result has been roads to nowhere—localised road network development critically deficient in terms of general connectivity and geared to economic sector-specific or political objectives (Rabelland et al. 2008). The requirement for broader network linkages is emphasised in overarching policy objectives. Runji (2015) cites the need for international road network connections. Essentially, current paved/all-weather connections centre on city to city, city to port, and primary sector industry to port, leaving extensive rural areas significantly under-served.

In relation to current road transport technology, it is evident that a comprehensive network of paved routes is desirable as a long-term investment objective. However, the fast pace of technological development contains an implicit caveat. A hypothetical breakthrough in hover vehicle technology, for example, could render permanent ways redundant. Given the vast physical and financial requirements for a total pan-African road system, some caution should be exercised in relation to a "track" solution to the problem. The alternative vehicle solutions are considered in Sect. 4.5.

4.3 Route System Characteristics

4.3.1 Simple Taxonomy of Route Type and Status

Typically, sub-Saharan African countries do not possess a mature urban infrastructure. The numerous urban centres characterising advanced industrial countries are the products of a sequence of economic (i.e., product market and industrial technological) developments that have not occurred in less developed countries. As a result of rapid industrialisation (and the absence of a residential middle class), urban development tends to be confined to national and district capitals and ports (see e.g., Alila et al. 2005). Economic under-development, producing a limited range of products, results in limited intra-national and intra-regional trade.

4.3.1.1 Route Type

Depending on these factors, typical sub-Saharan African route systems may be characterised as follows:

- rural centre to urban centre (RC/UC);
- rural centre to port (RC/P); and
- urban centre to port (UC/P).

Considering these in order:

1. RC/UC

From a road freight transport perspective, this category of route would transport agricultural products (substantially foodstuffs) to national (district) towns. This has implications for the type of transport unit required, which is considered later.

2. RC/P

In road freight transport terms, the probability is that the shipment of food/non-food produce in bulk would be undertaken. High volumes

are required for export purposes, typically to a national or regional port. Again, this type of traffic has vehicle specification implications, which are considered later.

3. UC/P

The road freight transport requirement for this route type would be the consignment of manufactured (finished/semi-finished) goods to the port against international contracts. Relevant transport technology is considered later.

4.3.1.2 Route Status

The fundamental difference between route systems/road networks in less developed countries and advanced industrial countries is the existence, in the former, of a mix of permanent and impermanent ways. Road surface quality in the two categories is significantly different and surmounting this difference requires the application of transport technology. Again, in terms of an elementary taxonomy, the following classification has been developed:

- rural centre/urban centre, unmade road;
- rural centre/port, unmade road/permanent way; and
- urban centre/port, permanent way.

1. Rural Centre/Urban Centre, Unmade Road

   This type of route is subject to major surface degradation resulting from vehicle use, soil slippage, flooding and so on. As a result it requires freight transport vehicles with all/rough terrain capability either permanently or seasonally.
2. Rural Centre/Port, Unmade Road/Permanent Way

   For this type of network section, a combination of rough and smooth terrain freight vehicle capability would be required. Note, although a rough terrain vehicle could cope with both types of road surface, the issues of fuel consumption versus shipment costs would have to be evaluated.

3. Urban Centre/Port, Permanent Way

   This part of the route system would require conventional smooth terrain vehicles. It is effectively an advanced industrial country standard road section. However, use of an appropriate vehicle type, in terms of body specification (permitting economic loading/discharge and transportation), is an important associated issue. This is considered in a later section.

4.4 Typical Features of Sub-Saharan African Road Freight Vehicles

Many vehicles acquired by sub-Saharan African hauliers were selected on the basis of capital cost minimisation. This reduces capital outlay by a large percentage but increases operating cost, especially in terms of maintenance expenditure. Operating cost, in this context, is increased in terms of more frequent and expensive maintenance and in terms of vehicle down-time, which can result in the loss of individual haulage contracts, individual customers and, more broadly, reputational damage to the firm.

Furthermore, used vehicles are typically acquired from advanced industrial countries with comprehensive paved road networks for employment in less developed countries with extensive unpaved road networks. This subjects vehicles, whose components are already degraded by use, to a testing transport environment, resulting in excessive stress on tyres, suspension and other components. The multiple route states (paved, unpaved, etc.) prevalent in SSA route systems necessitates the use of various types of all-terrain vehicle. Section 4.5 considers these in some detail.

Typically, SSA haulage firms are small and medium-sized enterprises with limited financial resources to apply to either capital or operating costs. This tends to preclude the acquisition of new and/or purpose-built freight transport vehicles. However, new, low-cost, all-terrain, multi-purpose vehicles are being developed. The potential of these are considered later.

The salient problems of sub-Saharan African road freight transport are outlined in Sect. 4.5.

4.5 Salient Problems Relating to Road Freight Transport

As stated in Sect. 4.1, the principal problems relating to sub-Saharan African road freight transport may be represented as:

- overloaded vehicles (per operating trip);
- under-utilised vehicles (per operating period);
- use of older vehicles;
- delayed vehicles at transit points (e.g., inland depots and ports);
- poorly trained vehicle operatives;
- high road freight transport prices; and
- low quality local/intra-regional road networks.

These problems are evaluated and probable causes identified.

4.5.1 Overloaded Vehicles (Per Operating Trip)

In a typical SSA haulage firm, the absence of systematic maintenance schedules and comprehensive transport administration generally, introduces a fortuitous element into the performance of freight transport. Uncertainty relating to the operating future and, therefore, of associated revenue streams, shifts focus and emphasis to the present. Given that, returns from a current freight contract possess a higher probability of realisation than returns from a projected contract. This results in a "jam today" mentality, encouraging present revenue maximisation and the operational consequence of vehicle overloading. A short-termist perception is compounded by high levels of uncertainty relating to the general environment. For example, political uncertainty ("macro"—national; or "micro"—tribal); or economic uncertainty (e.g., related to prices, taxes, etc.).

4.5.2 Under-Utilised Vehicles Per Operating Period

High vehicle utilisation depends primarily on three factors. Firstly, the availability of uniform flows of goods generated by a particular economic zone/freight transport catchment area. Secondly, the capacity to consistently capture freight contracts on either a short-term or long-term basis. And thirdly, the ability to allocate freight to vehicles and routes efficiently (freight transport administration capability). As far as the first factor is concerned, the fragility of factors of production is critical. In the primary sector (e.g., agriculture) context, climate and disease can impair output both in terms of detriment to agricultural produce and agricultural labour. In a secondary sector (e.g., manufacturing) context, supply chain disruptions (related to raw materials, semi-finished goods, etc.) can significantly affect demand for road freight transport. Regarding the second factor, a given haulier has to be attractive to customers in terms of both cost and quality. Providing these consistently may be beyond the capacity of small enterprises (in this case hauliers). For example, their capacity to absorb higher input costs (e.g., fuel costs) is limited, or they are unable, at short notice, to replace employees rendered unavailable by a particular set of circumstances. In relation to the third factor, the limited ability to calculate accurately the weights and volumes of a range of heterogeneous and non-standard goods may result in some under-utilisation of vehicles but the effect of this would be marginal.

4.5.3 Use of Older Vehicles

Second-hand vehicles can be bought for a fraction of the cost of new vehicles. This obviously renders them attractive to under-financed (by First World standards) sub-Saharan African haulage firms. The used vehicles in question will have been serviced and minimally re-equipped. However, a wide range of a given vehicle components will not have been replaced and will have been subject to considerable deterioration. This situation could result in a sequence of component failures, some of which

would render the vehicle temporarily (or permanently) unusable. In general, exporting used vehicle dealers do not provide maintenance contracts, leaving the owner to source components from a fragmented and incomplete supply chain. In some cases, "Third World ingenuity" could solve the problem, but consistent vehicle operation on the basis of such deficient servicing facilities would be problematic. Another significant problem resulting from employing used vehicles is their specification limitations in relation to a particular haulage firm's requirements. For example, vehicles primarily designed for the transportation of homogeneous packaged goods may subsequently be used for the transportation of heterogeneous bulk goods. More fundamentally, the absence of all-terrain capability in these advanced industrial country vehicles (designed for permanent ways) could prove to be a major problem. In the rainy season many roads (especially rural roads) are impassable. Even in the dry season, the risk of tyre damage (e.g., punctures) and suspension unit damage is high. This could result in serious delays in the delivery of goods, and even in non-delivery.

4.5.4 Delayed Vehicles at Transit Points (Inland Depots and Ports)

This factor is evidently substantially outside the control of the vehicle operator, as customs officials, border guards and others determine transit times at these points (indirect contributory factors). However, spurious bureaucratic factors can operate in this situation. Essentially, this signifies a decoupling of bureaucratic processes from functional administrative requirements regarding border administration procedures (determined by government regulations). Arguably, the phenomenon termed "mock bureaucracy" (Gouldner 1954) occurs, dissociating procedures from their objectives, such that processes become notional and ineffective. The impact of transit point delays on total delivery time can be major. Possibly their most deleterious effect is reputational damage to the local, national or regional supply chain. Official impediments to transit efficiency have been considered, but a major unofficial impediment—corruption—has

not. This is outside the direct control of the haulier, but solutions—to which the road freight vehicle operator may contribute—are considered in Sect. 4.7.

4.5.5 Poorly Trained Vehicle Operatives

Two factors are immediately apparent in relation to vehicle operative training. The first is that the technical education/training infrastructure available in First World countries is not available in Third World countries/regions—in this case, sub-Saharan Africa. For example, road freight vehicle driver's licence courses available in the UK/Europe are frequently operated by private providers. These are typically based on the formal vehicle categorisation/licensing instituted by the relevant transport regulatory authorities. The second factor is that original equipment manufacturer training is generally only provided in connection with new vehicle sales, as opposed to used vehicle sales. This situation relegates training to an informal procedure conducted by trainers whose own specific knowledge has been obtained on an ad hoc basis.

4.5.6 High Road Freight Transport Prices

Rabelland and Macchi (2008) distinguish between transport costs and prices in sub-Saharan Africa, positing a discontinuity between the two. Again, the fundamental causes of this problem could arguably be reduced to two principal elements. These may be characterised as the classic problem to which economic actors are subject—that of information asymmetry. One dimension of this relates to structural information quality. This comprises the extent to which information bases have been systematically developed and integrated. High levels of systematisation and integration are essential to information transparency—in this case road freight tariff comparability. The disconnect between transport costs and prices is facilitated by this non-comparability. Another dimension of this information asymmetry relates to the relative non-accessibility of transport cost and price information, resulting from the absence or

informality of hauliers' tariffs, and in particular price comparison information. This information could be significantly improved with the extensive availability of mobile phone technology in Africa. There are two evident benefits. Firstly, freight transport end users are able to communicate more easily to discuss road freight costs (in non-competitive contexts). Secondly, some road freight transport operators will have published tariff information on mobile-compatible websites, eliminating obscure "spot market" transactions by operators attempting to individualise transport contracts on a "what the market will bear" basis.

4.5.7 Low Quality Local/Intra-Regional Road Networks

Fundamentally, there are two problems that render sub-Saharan African roads qualitatively deficient. The first is the problem of connectivity. Where adequately financed public bodies exist, road construction is completed on the basis of social as well as economic objectives. This is the case, for example, in all advanced industrial countries. In states where these governmental/quasi-governmental institutions are absent—typically in less developed countries—then (major) road network developments are completed on the basis of economic justification or "business case". The practical effect of these criteria is the development of disconnected and unintegrated road systems in terms of social or socio-economic objectives. The second problem consists of road surface quality. Unpaved roads (and roads with low grade paving) deteriorate rapidly, particularly in the wet season. This can render them impassable to non-all-terrain vehicles, significantly impeding road freight transport connections. As a minimum, excessive component wear and tear and/or component failure is a frequent occurrence, delaying or disrupting freight transport services.

Relevant transport technology (as opposed to permanent way technology) is now examined to identify its potential for generating solutions to the problems outlined in the preceding subsections. An evaluation of basic road freight vehicle technology is undertaken in Sect. 4.6.

4.6 Key Components of Road Freight Technology

4.6.1 Proposed Solutions to Road Freight Transport Problems

The problems associated with road freight transport in a sub-Saharan African context is addressed here, and solutions proposed that focus on transport technology as opposed to road technology/highway engineering. Transport technology is broadly defined and may include materials handling technology.

4.6.2 Transport Unit Classification

Fundamentally, from a logistics viewpoint, road freight transport units may be categorised in terms of their chassis and body specification. Chassis specification (rigid or articulated) is essentially concerned with transport efficiency and economics, based on the separability/non-separability of the tractive and transportive components of the vehicle. Body specification is concerned with load capacity utilisation and materials handling efficiency in relation to different types of cargo and packaging specification.

4.6.2.1 Rigid Vehicles

This type of road freight vehicle design comprises the integration of the passenger (driver/operator) compartment and the cargo carrying compartment (body). Typically, its carrying capacity (expressed in weight, as opposed to volume terms) is 0.25–20.00 metric tonnes. It is a suitable design (as opposed to an articulated configuration) for this carrying capacity and where manoeuvrability and local road 'rolling load' bearing capability are constraints. Another road freight vehicle design—which presents classification problems—is the road train or drawbar–trailer combination. This does not constitute a conventional articulated vehicle

configuration even though the rig is articulated. In this context, it is defined as a rigid vehicle pulling a trailer. These vehicles have a high load capacity (40–50 metric tonnes). It is worth noting that in Australia—where uncongested straight roads permit it—multiple trailers (as many as four) are pulled by the tractive unit and in Scandinavia super-cube tractive units pull high capacity trailers. However, road load-bearing capacity is critical here, which, among other reasons, would render these rigs unsuitable for use in SSA.

4.6.2.2 Articulated Vehicles

This type of road freight transport features a separable tractive unit (passenger compartment) and trailer unit (cargo). It is suitable for trips where a high cargo carrying capacity is required (20–30 metric tonnes) and where manoeuvrability and road load bearing capacity are not constrained. Its primary advantage is operational and economic, permitting a single tractive unit to couple/decouple trailers such that trailer loading and discharge can proceed in parallel (as opposed to in series) with trailer transportation. It presupposes the existence of minimum cargo volumes and a network/cluster of transport users in a defined geographic area. Again, this is typically problematic in sub-Saharan African regions (outside major urban conurbations/ports).

4.6.3 Body Types

Road freight vehicle body types have evolved (in advanced industrial countries) over the last 125 years. Early vehicles (late nineteenth and early twentieth century) were characterised by low carrying capacity and generic body designs. These were associated with relatively low volumes of cargo from individual consignors. Pressure to rationalise vehicle body design resulted from generalised/economy-wide mass production, which developed during the First World War (1914–1918). Improvements to consignment delivery schedules driven by user requirements (consignor/consignee/final customer) resulted in operational pressure for (road) haulage companies, consequently the design of road freight vehicles,

materials handling equipment and packaging became more sophisticated. In this context, there is a particular interest in the synergy between vehicle body and cargo packaging design.

4.6.3.1 Flatbed Bodies

This generic road freight vehicle body design accommodates large, irregular cargo units that must be secured with ropes, straps, nets, tarpaulin and so on. It is arguably the most versatile body design in that it can transport every type of cargo/package. However, it provides minimal protection for the load. The design permits extensive access for mechanised/automated cargo handling equipment (e.g., forklift trucks).

4.6.3.2 Sided (Slatted/Closed-Sided)

This design encloses the cargo and places a constraint on the horizontal dimensions. It does, however, provide high accessibility for loading/discharging operations and, again, comprises a versatile cargo platform. Typically, the (foldable) sides on a closed-sided design are lower (0.5 m); and higher (2 m) on a slatted-sided vehicle.

4.6.3.3 Box Van

This is the standard road freight vehicle design for packaged goods (especially cartoned goods). It provides the cargo with a high level of protection against adverse weather and is secure. However, with the exception of curtain-sided vehicles, it restricts the use of mechanised materials handling equipment and cannot accommodate out-of-gauge cargo.

4.6.3.4 Bulk

This body type constitutes a high-sided open truck design and is used to transport bulk (i.e., unpackaged) goods. Typically, it is fitted with a tipper mechanism—operated by hydraulic rams—that massively accelerates the

discharge rate. It can be used for a range of commodities (especially granular goods), for example, grain, root crops, among others.

4.6.4 Road Freight: Load Classification

Having considered the basic range of road freight vehicle body types available, we proceed to a brief consideration of cargo types. This is important because a match between these two factors is essential for efficient, cost-effective materials handling and transportation. The classic, quaint image of the general purpose African truck, overloaded with multifarious cargoes, has a serious negative impact on logistics costs and the reputation of the regional/continental logistics industry. This, in turn, impacts negatively on national, regional and international sourcing/procurement decisions, inflicting significant economic damage.

4.6.4.1 Break-Bulk

This category covers any packaged goods. Broadly, this includes cartons, cases, pallets, bales, bundles, carboys, and so on. Essentially, break-bulk goods must be handled and transported as units, ideally with specialised materials handling and transport technology. For example, forklift trucks have specialised attachments for handling pallets, cartons, bales, and so on. Break-bulk cargoes can be further classified as: high weight/volume/indivisible loads (requiring low-loaders, heavy-lift cranes, etc.); low weight/volume divisible loads; loose (low volume); and packaged.

4.6.4.2 Bulk

Fundamentally, this cargo category splits into granular and non-granular materials. The importance of this dichotomy relates to the flow properties of the material and whether, for example, gravity-based or pneumatic materials handling systems can be employed to deal with the cargo. Economic materials handling and transportation necessitates the use of specialist technologies, debarring the employment of generalist ones.

This specialisation is typically guaranteed by the requirements of scale economies (minimum efficient scale); and attracts large-scale investment from major corporations. We now proceed to a consideration of selected road freight problems and associated transport technology solutions in Sect. 4.7.

4.7 Road Freight: Problems and Transport Technology Solutions

4.7.1 Typical Road Freight Transport Problems

This chapter centres on transport technological solutions to sub-Saharan African logistics problems. A restatement of typical problems and generalised solutions precedes the sections of this text that systematically analyse the components of the road freight transport system in order to identify critical factors requiring amelioration.

4.7.1.1 Overloaded Vehicles (Per Operating Trip)

Fundamentally, this problem is caused by microeconomic short-termism and the proximity of the business horizon. The inconsistency of SSA road freight services (caused for example by deficient road and/or vehicle maintenance) results in an unpredictable income stream for the transport operator. A counter-productive effect of this financial factor is to motivate the haulier to maximise certain present income, given the extreme uncertainty of future income. This produces a vicious circle, as overloaded vehicles reduce service consistency and dissuade transport end users from engaging in repeat contracts. In addition to this negative local reputational effect on transport demand, there are negative national and international/regional reputational effects. A principal result of these may be to deter the purchasers of transported goods from sourcing on a pan-sub-Saharan basis. This perception can only be countered if there is a credible possibility that transport operators will desist from overloading to permit service consistency and produce positive reputational effects, resulting in significant long-term increases in demand levels/business activity.

The availability of (new) purpose-built vehicles—for example, the Ox Global Vehicle (produced by an offshoot of the McLaren Group of Formula 1 fame)—with clearly specified carrying capacities could assist the realisation of this objective. New vehicles would be accompanied by comprehensive technical documentation and potential operator training, which would reinforce the criticality of conforming to capacity constraints.

Another technological determinant that could counteract vehicle overloading is the provision of standardised modular containers (constructed from durable plastics). Given the average density of goods in a typical multi-consignment vehicle load, the capacity limitation imposed by this packaging technology would counter serious vehicle overloading. Container design should incorporate specifications covering a wide range of agricultural and industrial products, such that it does not impede or protract materials handling. The weight and volume of typical containers should accommodate manual handling, given the limited availability of mechanised or automated materials handling equipment in a sub-Saharan African context.

4.7.1.2 Under-Utilised Vehicles Per Operating Period

The negative reputational effect resulting from vehicle overloading could contribute to a "lumpy" demand for goods (and therefore for road freight transport services) from a particular locality, nation or region. Where transport services are problematic—and therefore supply security is threatened—purchasers may decide to source from the area on an ad hoc/supplementary basis. Assuming that the number of purchasers of a given product group was insufficient to generate a consistent demand level, demand lumpiness would inevitably result. What is implied is the need for a massive reputation management/public relations exercise. However, this must not be mere spin, but based on a scientific revolution in the application of appropriate transport technology. This should result in the transformation of logistics quality and increased areal sourcing of a range of products by local, national and international procurers.

4.7.1.3 Use of Older Vehicles

The business-economics driven practice of acquiring used (imported) vehicles for freight transport fleets has a number of deleterious effects on operational quality. Firstly, vehicles designed for a First World operating environment are transferred to and utilised in a Third World operating environment. Components (particularly tyres and suspension units) in vehicles obtained from the northern hemisphere are designed for use on smooth, firm, permanent ways. When these components are subjected to radically different conditions in terms of surface impact and traction, they fail before the completion of their technical life cycle. Secondly, they are designed to transport relatively homogeneous packaged goods in a high precipitation climate. These conditions have resulted in the development of closed box van style bodies. In a sub-Saharan African context, goods are typically unpackaged and heterogenous, and outside the rainy season there is little precipitation. Associated with these body design factors is loading technology. For example, box vans/trailers are frequently fitted with unpowered (dumb) or powered rollers, designed for use with palleted or cartoned goods. These have the requisite flat bases, unlike unpackaged irregular forms of cargo, which would have to be laboriously man-handled into the vehicle.

Although requiring a high capital expenditure/outlay, new and purpose-built vehicles eliminate many of the problems outlined above. Also, the appropriate specification of such vehicles would result in lower revenue expenditure and probably lower total costs. The fundamental problem of component failure, caused by a hostile route system based in difficult terrain, could be effectively neutralised by creative/specialised road freight vehicle design. Military vehicles necessarily incorporate all-terrain capability into their designs. They are typically highly specialised (frequently functioning as weapons platforms), and do not possess ab initio the required cargo-carrying capacity. However, a cab–chassis base could potentially be fitted with a high freight capacity body, combining freight transportation with all-terrain capabilities.

As indicated earlier, the critical foundation for a switch from used loose-specification road freight vehicle fleets to new tight specification equipment is effective communication regarding its economic benefits. Unstable micro- and macroeconomic environments militate against the

long termism required for significantly higher levels of capital expenditure. When hauliers are able to perceive clearly that superior transport technology will result in higher service quality and improved business generation/demand levels, they will be more amenable to the required investment scale. This is, essentially, a socio-cultural problem/exercise.

4.7.1.4 Poorly Trained Vehicle Operatives

As previously stated, a significant factor relating to this problem is the fact that the used vehicles typically acquired by sub-Saharan African road freight operators lack the technical (instructional) support provided with new vehicle purchases. If original equipment manufacturers could be induced to provide low budget internet-based product support (via a website or Skype)—as a public relations or brand marketing exercise—the problem could be alleviated. Alternatively, the acquisition of low cost new vehicles (e.g., the Ox Global Vehicle) would automatically guarantee the provision of product support.

4.7.2 Road Freight Transport: Realising Efficiency

Operational efficiency is realised via the optimum combination of logistics assets. Logistics has a broad definition, incorporating inbound and outbound stages (Porter 1985). Arguably, the definition of logistics is not as wide as supply chain management, which would incorporate certain production functions (e.g., synchronous manufacturing). For the purposes of this chapter, logistics focuses on materials handling, storage and transport.

4.7.2.1 Vehicle Type

Basically, this breaks down into rigid and articulated vehicle designs, which have implications for the selection of other elements: capacity; body type; cargo type. Another critical factor in an SSA context is the rough all-terrain versus smooth terrain capability on the part of the road freight vehicle. This factor is considered in a previous section on route/

network classification. However, it should be reiterated that the transit capacity (the capability to operate on a particular route) and the performance level of the vehicle operating on unmade roads are critical factors for road haulage efficiency. These dimensions impact on customer service levels and ultimately the economic viability of local, national, regional and international supply chains.

4.7.2.2 Vehicle Capacity

In microeconomic terms, vehicle capacity requirements are determined by the output volumes and frequencies of individual firms (whether related to primary/extractive, secondary/productive or tertiary/service sectors) (see Havenga et al. 2011 and Havenga 2013).[2] In mesoeconomic terms, the capacity requirements of a strategic cluster or entire industry determine the local and national vehicle pool capacities, and ultimately an individual vehicle capacity. For the purposes of this chapter we are primarily concerned with the minimum efficient scale of the individual transport unit. This element also relates to the production technology associated with particular product groups. Fundamentally, these technologies are individual customisation (one-off production items), batch production (large/small group of discrete items) and flow production (large volumes of bulk/commodity items). These basic definitions omit recent developments in production technology—that is, mass customisation, which combines the first two categories and is exemplified by contemporary automotive production. As far as native industry (with its low investment levels) is concerned, sub-Saharan African manufacturing is dominated by individual customisation. The agricultural sector is primarily geared to small batch production (except where technological investment by multinationals has permitted the utilisation of large batch or flow production).

4.7.2.3 Body Type

Road freight vehicle body type is dictated primarily by two factors. Firstly, cargo containment, within the boundaries of the vehicle body is a requirement for safe, secure and cost-effective transport. Secondly, materials handling efficiency, which is discussed later. Vehicle body designs have been outlined in a preceding section but essentially can be reduced to

bulk and break-bulk types. Bulk goods bodies themselves comprise the freight unit and perform the key functions of packaging for the cargo (i.e., containment, protection, etc.). Break-bulk goods bodies provide secondary packaging functions, while the package itself (carton/crate/case, etc.) provides the primary packaging functions. As far as materials handling efficiency is concerned, the key considerations are the suitability of the equipment for handling the particular freight unit (packaged or unpackaged bulk quantity) and the accessibility of the vehicle cargo compartment. Any deficiency in these vital characteristics translates into significant increases in cargo loading and discharging times, and significant increases in logistics costs.

4.7.2.4 Cargo Type

The fundamental division under this heading, again, is between bulk (unpackaged) and break-bulk (packaged) cargoes. Matching specific cargoes to vehicle type, vehicle capacity and body type is essential for high efficiency/low cost operations. To this should be added the dimension of hazard. Goods may be fundamentally categorised into hazardous and non-hazardous groups. In advanced industrial countries, highly developed, extensive health and safety legislation facilitates the safe transportation of hazardous goods and this is operationalised via the development of specialised goods vehicles. The absence of mature regulatory authorities and sophisticated transport assets, results in limited health and safety legislation, and even more limited compliance with that legislation. As far as the handling and transportation of hazardous goods is concerned, there is considerable convergence between efficiency and safety (i.e., specialist materials handling and transport equipment results in conformity with both criteria).

4.7.3 Route/Terrain Factors

In order to realise technically efficient road freight transport in a less developed country context, certain modifications to the transport unit are required. Evidently, these relate mainly to transits over rough terrain routes. The key technical requirements are examined.

4.7.3.1 Unmade Road

Tyres: Thicker Walls/Deeper Tread

Two key features of unmade roads are vulnerability to significant surface damage and penetrative objects. Even without the existence of climatic extremes (e.g., tropical rainfall levels) soft road surfaces are subject to extensive erosion, and all-terrain tyres with a deeper tread and improved traction are required. Combined with thicker tyre walls, this tread specification critically reduces susceptibility to tyre damage and punctures.

Suspension: Heavy Duty

In the context of transiting unmade roads, featuring ruts, potholes and foreign bodies (rocks, branches, etc.) the requirement for heavy duty suspension is self-evident. The key question, in financial terms, is whether standard units can be sourced economically either for original vehicles or to upgrade vehicles currently in service.

Gearing: Lower

Efficiently utilising rough terrain routes necessitates low(er) gearing for effective traction. The cost of adaptation, or original equipment manufacture, will depend essentially on the existence of scale economies regarding the production or modification of gearboxes for the relevant vehicles.

Ground Clearance: Higher

Uneven road surfaces subject vehicles to the risk of grounding. This must be counteracted by raising the vehicle body via the suspension units or by another method.

4.7.3.2 Permanent Way

Essentially, this implies that tyres, suspension and gearing may be standard, as utilised in advanced industrial countries.

In later sections, stereotypical consignment categories are selected and the requirements for their efficient handling and transportation are outlined.

4.7.4 Transport Technology/Trip Optimisation

4.7.4.1 Example 1: Unsawn Timber

Example: Unsawn Timber

- Route type: rural centre/port
- Route status: unmade road
- Vehicle type: articulated
- Vehicle capacity: 20 tonnes
- Body type: skeletal trailer/low loader
- Special equipment: winch
- Terrain: rough terrain/all-terrain adaptations

Cargo: Unsawn Timber: Notes

1. Tropical timber (generally hardwood) is a high value commodity entering international trade. The transit would therefore be rural centre/port.
2. Route status is evident from 1 – that is, unmade road.
3. Vehicle type is dictated by the length of uncut/cut logs. The typical dimensions (length) of the freight unit would require the use of an articulated vehicle.
4. The weight of the freight unit would require a carrying capacity typical of this vehicle type.

5. This type of cargo would require an open/unobstructed cargo compartment—a skeletal trailer or low loader would be the obvious trailer types to choose.
6. A simple materials handing device, which is frequently integral to the vehicle (low loader), is a winch which, depending on its capacity/rating, is an effective mechanism for loading unsawn timber. However, an integral hydraulic crane with a specialised attachment would be preferable.
7. All-terrain tyres should be fitted (as a minimum) with modifications to suspension and gearing.

4.7.4.2 Example 2: Palm Oilseed

Palm Oilseed

- Route type: rural centre/port
- Route status: unmade road
- Vehicle type: articulated
- Vehicle capacity: 30 tonnes
- Body type: tipper truck
- Special equipment: tipping mechanism
- Terrain: rough terrain/all-terrain adaptations.

Cargo: Palm Oilseed: Notes

1. Agricultural products traded in export markets.
2. Typical route type.
3. An articulated design would be required to provide adequate capacity for a typical (bulk) cargo.
4. High capacity vehicle essential to transport bulk cargo efficiently and economically.
5. Tipping body vital for time-efficient discharge of this cargo.
6. Minimum all-terrain adaptations (all-terrain tyres) to vehicle required.
7. Note, the availability of oilseed crushing and liquefaction technology would result in this product being handled and transported as a liquid (e.g., in a tanktainer).

4.7.4.3 Example 3: Craft Products/Giftware

Craft Products/Giftware

- Route type: urban centre/port
- Route status: permanent way
- Vehicle type: rigid
- Vehicle capacity: 20 tonnes
- Body type: box van
- Special equipment: none
- Terrain: smooth terrain.

Cargo: Giftware: Notes

1. Road networks connecting urban and industrial centres (e.g., ports) comprise arterial routes.
2. The existence of a permanent way can be presumed between these types of centre for the vast majority of sub-Saharan African states.
3. Standard rigid vehicle (up to 20 metric tonnes freight capacity) would be adequate for low density cargo (e.g., giftware).
4. Box van body would be required to protect a relatively fragile finished goods cargo.
5. Only standard materials handling equipment would be required (e.g., pallet truck).
6. Smooth terrain transit obviates the need for all-terrain adaptations.

4.7.4.4 Example 4: International Destination Goods

In the context of international transport, high capacity transport units (e.g., container vessels) and high capacity freight units (e.g., ISO freight containers) are essential for economic (i.e., commercially viable) operations. In order to achieve the required efficiency levels for economic operations, large-scale investment in international logistics has been undertaken particularly by large shipping lines and port authorities. Modern Chinese container vessels— with a carrying capacity of up to 19,000 teus (20 ft equivalent units)—reduce the

logistics component of the total procurement cost (franco domicile) to a small percentage. In addition to the scale economies applicable to the main transit stage (sea transport), the inter-modality of standard freight containers further reduces cargo handling and transport costs (particularly because the turnaround time of the transport unit—for example, the road freight vehicle—is reduced) (see, e.g., Van Eeden and Havenga 2010).

We will now consider specialist types of freight unit (freight container) utilised in an international logistics context.

1. Inter-modal transport unit. International Standards Organisation (ISO) containers are designed to be efficiently transferred between transport modes, particularly where transport units are based on a purpose-built, modular design and utilise specialist container-handling equipment. These include container gantries, straddle carriers, spreaders, and so on. In principle, all transport modes (road, rail, sea and air) may be utilised. In terms of sea transport, either specialised container vessels or conventional cargo vessels may be employed. The former are modularised to carry an exact number of container units and the latter will carry whatever quantity of non-containerised cargo will fit (generally on deck for accessibility reasons) (see, e.g., Audige 1995).
2. 20′/40′ container. Originally, modularity based on 40′ slots—particularly for road and rail chassis units—resulted in the development of 10′/20′/30′/40′ modules. Of these, 20′ and 40′ units are the most common.
3. Standard general cargo container. This comprises an enclosed box van design, primarily built to transport packaged goods (particularly cartons, as the container itself constitutes the outer packaging).
4. Open-top/bulk container (specialised cargo). A range of specialised container designs exist. These include open-top, for large indivisible loads requiring protection; bulk; flat-rack, for large, durable loads; among others.

Finally, we consider some organisational developments that could positively impact the efficiency of freight transport management in a sub-Saharan African context.

4.8 Organisational Developments Regarding African Road Freight Transport Efficiency

4.8.1 Cargo Hub Concept

The economic transportation of medium and long-haul cargoes requires the use of high capacity transport units (e.g., 20 metric tonnes carrying capacity minimum). Many consignments comprise part vehicle loads and require consolidation to realise transportation economies. Consolidation operations may be required selectively for domestic consignees and comprehensively for international consignees where containerisation is involved. International consignments utilising conventional cargo vessels may avoid consolidation, but can incur uneconomic minimum handling and port usage (port rates) charges.

A significant proportion of small consignments will come from either rural or minor urban centres that are serviced by unmade roads. These may be efficiently transported by a new generation of low capacity road freight (or multi-purpose) all-terrain vehicles, such as the Ox (produced by associates of the McLaren motorsport group).

4.8.2 Cargo Hub Concept: Operational Examples

Having outlined the basic purpose of a cargo hub in a less developed country context we proceed to consider some examples of road freight transport configurations. These are based on stylised transits, utilising the most common examples.

4.8.2.1 Road Freight Transport Configuration

Rural Centre – Urban Centre/Port Stage: Low Capacity All-Terrain Truck

Frequently, consignments generated by African rural centres are small quantities of comparatively high value goods (e.g., spices, textiles and gift-

ware). Assuming that the relevant road network is dominated by unmade roads, an all-terrain vehicle is required. Under extreme climatic conditions (e.g., in the rainy season) this type of vehicle would be essential to complete the transit. Added to this is the consideration of individual haulier reputation—and ultimately the reputations of local, national and regional supply chains. Using the example of the Ox Global Vehicle, a transport unit of this specification can carry 2 metric tonnes of goods (including three standard units of palletised goods). Pallet design variants may include flat pallets for packaged goods and box pallets for mini-bulk goods.

Urban Centre – Urban Centre/Port Stage: High Capacity Smooth-Terrain Truck

For this type of transit, higher volumes of goods are generated from urban centres, permitting the use of relatively high capacity vehicles. Articulated vehicles, featuring either box van trailers or general cargo containers (based on skeletal trailers) can be utilised for this type of route. If the transit were purely domestic, container units could be unstuffed at an urban freight hub (containerbase). If the transit were international, greater logistical efficiency could be realised utilising the containers' inter-modal capability—that is, it can be transferred from road to sea without unloading and reloading. This significantly reduces handling costs (and transport costs) via reduced turnaround times for the relevant freight transport unit (especially containerships). This type of transit can use either full container loads (FCL) where a single consignor can generate a complete container load, or less-than-container-loads (LCL), where small freight quantities can be delivered to a containerbase for consolidation and onward sea transport.

In the next section, we consider in broad terms the benefits that professionalisation of the sub-Saharan African road haulage sector could provide.

4.8.3 Professional Haulier Concept

The severe operational limitations of small, non-specialist African haulage firms can be significantly ameliorated by synergistic business

combination or by the development, ab initio, of appropriately resourced, scale-economic professional haulage firms.

4.8.3.1 Existing Local Hauliers to Sell-Out/Buy-In to NGO/ Third Sector Funded Professional Haulier

A standard solution to inefficient market structure (perfect competition) and firm size (micro-business) could be the formation of third sector funded professional haulage firms. Self-evidently, in addition to start-up finance, high quality logistics consultancy services should be provided to make available expertise on organisational design, systems design, management techniques, and so on.

An appropriate set of tangible and intangible assets for a professionalised haulage firm could be as follows:

- specialist equipment—low capacity: 2× Ox Global Vehicle;
- specialist equipment—high capacity: for example, 2× tractive units; 5× trailer (2× general cargo container/trailer; 1× bulk container/tipper trailer; 1× skeletal trailer; 1× low loader and winch);
- all-terrain enhancements: tyres/suspension/ground clearance;
- teleservicing contract: original equipment manufacturers to provide video conferencing-based/documentary support;
- improved efficiency: resulting from specialist equipment utilisation; and
- reduced cost: resulting from specialist equipment utilisation.

4.8.4 Logistics Administration Rationalisation

Whilst the focus of this chapter is on the freight transport unit (vehicle), the efficiency, effectiveness and economy (the three Es) with which it is used is fundamentally dependent on the administrative infrastructure that controls its operations. Central to this infrastructure is the ICT facility, which when rationally employed can beneficially affect the three Es.

The subject of logistics administration is divided into the following topics:

1. vehicle route planning;
2. vehicle movement scheduling;

3. consignment scheduling;
4. consignment scheduling constraints:
   - material types
   - consignor operating system
   - consignee operating system;
5. ICT systems.

4.8.4.1 Vehicle Route Planning

Firstly, this may be construed as a macro-level operation, which focuses on the basic vehicle routing requirements as dictated by the existence of permanent ways and unmade roads that constitute local, national and international (regional) route networks. Secondly, vehicle route planning may be seen as a micro-level operation that evaluates routing options and determines the optimum distribution route. In a sub-Saharan African context, route networks are comparatively simple (i.e., containing relatively few elements), which obviates the use of sophisticated computer-based route planning programmes. However, a heuristic model, for example, the Savings Algorithm (Mann 1967) could be utilised.

4.8.4.2 Vehicle Movement Scheduling

For the purpose of vehicle movement scheduling, it is essential to differentiate bulk and break-bulk consignments. As far as bulk consignments are concerned, vehicle scheduling and consignment scheduling are synonymous, which simplifies logistics planning (particularly if the consignee specifies a precise delivery window). Regarding break-bulk consignments, a compromise has to be reached between economic distribution (e.g., vehicle load factors) and economic production (e.g., batch sizes). In relation to a sub-Saharan African scenario, where a substantial proportion of cargo comprises raw materials, consignee delivery schedules are probably flexible (facilitated by high stockholding levels).

4.8.4.3 Consignment Scheduling

As far as this critical logistics function is concerned, country economic classification is a salient factor. In an advanced industrial country or newly industrialised country context, supply chains/logistics functions would probably be time-critical. This is exemplified by the Brazilian and Chinese automotive sectors which incorporate advanced industrial country (ultimately Japanese) best practice. Where industry sector production processes are subject to high sub-process inter-dependencies, delivery schedules are necessarily inflexible and vehicle load factors must be compromised. In less developed countries, dominated by raw materials/bulk goods distribution, consignee operational constraints are less severe and consequently delivery schedules are more flexible/less time-critical.

4.8.4.4 Consignment Scheduling Constraints

As far as SSA is concerned there is incipient, wide-ranging economic development/industrial modernisation. This is symptomised by, for example, logistics investment (e.g., in specialised handling, transport and storage equipment by First World multi-national corporations) and institutional development (e.g., in single window trans-border customs posts). It is therefore relevant to consider the implications of the development of modern manufacturing resource planning (MRP/MRP2) systems (Slack et al. 1995) and associated logistics resource planning (LRP) systems (Christopher 1994) and their interactions.

1. Material types. An elementary way to distinguish a consignee's materials requirements planning (which has a critical scheduling component) is to use the classic division of material types for manufacturing purposes—that is to say: raw materials; semi-finished goods; and finished goods. This will now be utilised to exemplify the interface between distribution and production— effectively, MRP and LRP.

As a generalisation, raw materials are consigned against stock, as opposed to orders. The typically lower value of this type of material (relative to semi-finished and finished goods) permits comparatively large quantities of it to be held for a given time period (guaranteeing supply security). In financial terms, this impacts positively on current ratio (securing short-term credit) but negatively on stock (asset) turnover (reducing asset management efficiency). Exceptions to this general principle would be, for example, where critical high value ingredients are made to order and delivered on a just-in-time basis. This would obviate the requirement to hold high value stocks, which would negatively impact the stock turnover ratio and the efficiency of current asset management.

Semi-finished goods are probably subject to greater supply chain/logistics process integration, requiring greater co-ordination between consignor and consignee and a more tightly scheduled logistics operation. In a contemporary lean manufacturing environment, goods are made to order (as opposed to made to stock) and therefore subject to rigorous delivery scheduling. Even in a comparatively heuristic less developed country environment, consignment timetables are relatively controlled. It should also be noted that, relative to raw materials, there is greater value-added, and therefore greater average stock value. This factor determines lower stockholding levels, requiring higher levels of supply chain co-ordination/integration.

Finished goods logistical support involves, in principle, the highest level of logistics co-ordination/supply chain integration because of the time-critical nature of customer service levels/satisfaction. Given that international trade/exports predominates in sub-Saharan African volumes and values (in relation to regional/domestic trade), suppliers are typically confronting First World customer bases with their minimal dissatisfaction threshold. This renders efficient logistics/integrated supply chains mandatory. Again, the question of minimising the financial cost of holding finished goods stocks comes up, as finished goods have a higher value-added than semi-finished goods, therefore stock level minimisation is even more critical.

In summary, it can be stated (as a generalisation) that raw material/semi-finished goods/finished goods require low/medium/high degrees of logistics/supply chain integration, respectively.

The stockholding policy and consequent distribution scheduling is considered in an earlier section. Combinative factors—that is, the relationships between consignor and consignee operating systems—are now evaluated and their impact on the required levels of supply chain integration considered.

2. Consignor operating systems. When estimating the desired levels of logistics co-ordination/supply chain integration, the emphasis, historically, has been on the requirements of the consignee (the high profile automotive industry is one example). This involves a large-scale original equipment manufacturer. However, it is possible to identify situations in which the consignor requires short cycle distribution scheduling. For example, where production stock storage capacity is at a premium, greater physical distribution (outbound logistics) co-ordination is required between consignor and consignee. A producer of high volume production units (e.g., prefabricated housing) would predictably require a rapid delivery of output.
3. Consignee operating systems. The precision and predictability of delivery scheduling may be thought of as a function of production system complexity and production cycle length. Greater system complexity and shorter cycle length ostensibly requires higher levels of supply chain integration, and vice versa.

Figure 4.1 summarises the consignor and consignee operating system interaction and its impact on logistics co-ordination levels (Fig. 4.1).

Regarding Production System Complexity

1. Production system complexity may be defined in terms of the number of sub-processes contained within a total production process. More processes mean greater complexity, and vice versa.
2. Production process and sub-process cycle periods (duration). Shorter cycle periods produce higher complexity systems, and vice versa.
3. Production system complexity is more significant for raw materials and semi-finished goods logistics, but may be significant for finished goods logistics where, for example, third party logistics organisations provide order picking services (requiring multi-product assembly).

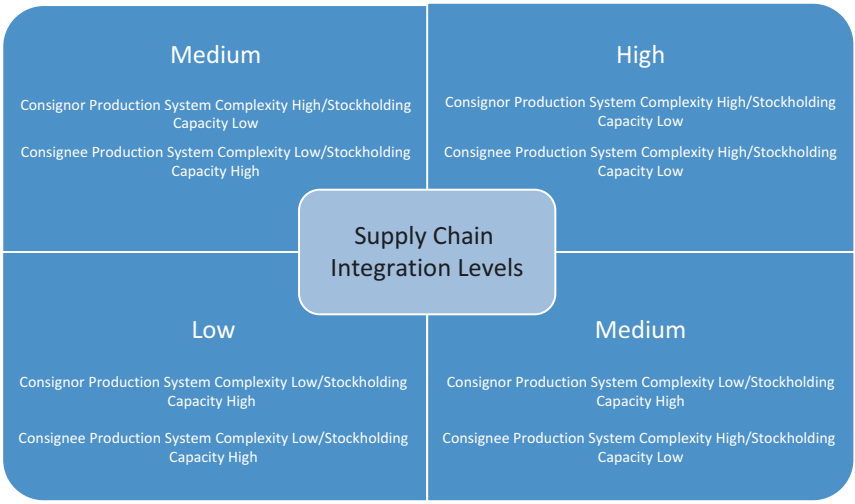

Fig. 4.1 The relationship between consignor/consignee production system complexity and stockholding capacity and supply chain integration levels. (In relation to Fig. 4.1 it should be noted that the qualifications regarding production system complexity and stockholding capacity are relevant)

Regarding Stockholding Capacity

1. Capacity of physical storage at the facility site
2. Financial capacity of the firm to hold stocks
3. Stockholding that is optimal for the relevant production system
4. Stockholding appropriate for market demand.

ICT Systems

In operational terms this constitutes a highly technical and specialised set of disciplines. Its strategic value is the concern of this chapter. From an LRP perspective, it facilitates inter-organisational co-ordination and maximises resource utilisation. Essentially, in a supply chain context, it provides inter-partner data/information regarding stock levels and usage rates that assist operational planning (i.e., extending the planning

horizon). Optimally, it utilises high capacity electronic data interchange systems, dedicated to the use of an organisational cluster. In relation to capital cost, ICT is a comparatively low expenditure item. It is critical in a sub-Saharan African context that institutions leapfrog outmoded technologies to optimise their competitive advantage.

We now attempt to summarise and draw conclusions from this provisional identification of problems and solutions regarding road freight operations in sub-Saharan Africa.

4.9 Conclusions

Sub-Saharan logistics per se (in particular road freight transport) has been characterised by technical and financial under-investment. This is contextualised by a general resource privation, specifically impairing institutional development (particularly organisations responsible for technical education and professional development in the logistics/freight transport domain). The problem may be addressed on a bottom-up basis, by identifying the critical components of road freight transport and achieving incremental, but significant, improvements in these areas. As far as transport technology is concerned, the key factors are: vehicle type; body design; cargo type; and packaging form. These must be related to road network specifications, in particular dichotomising them into rough and smooth terrain sections. Associated with this analysis are materials handling technology and equipment specifications. Contextualising this is a requirement for organisational development, specifically cargo hubs for sorting and consolidating consignments and the formation of professional logistics (road haulage) firms that can systematically and comprehensively apply the identified technologies that have been long extant in advanced industrial countries. In order to expedite national, technological progress, it is essential for sub-Saharan African nations to leapfrog outmoded (transport) techniques, and so the issue of supply chain integration has been outlined. Bottom-up initiatives are, by definition, small scale and progressive, and for that reason would be amenable to an action research approach. This method would research defined (road freight

transport) problems and co-devise with the research subjects operationalisable solutions. This micro-technological approach obviates the need for cumbersome multi-agency co-operation with all the political impedimenta associated with large-scale initiatives. Significant improvements in road freight transport technology in a sub-Saharan African context are realistically achievable and would generate massive reputational benefits for regional procurement and its foundational supply chain.

Notes

1. Permanent ways comprise macadamised or concrete roads/routes.
2. The phrase "frequencies of individual firms" refers to how often the output is generated for transport purposes.

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Part II

Global Value Chain and Commodities Trade

5

Commodity Price Volatility: Causes, Policy Options and Prospects for African Economies

John J. Struthers

5.1 Introduction: What Are the Causes of Commodity Price Volatility?

The economics literature on commodity price volatility has a long history going back to the seminal work of Keynes (1942), Newbery and Stiglitz (1981) and Deaton and Laroque (1992) among many others. Causes of commodity price volatility involve a combination of structural factors that are inherent in the very life cycle of the commodity itself (e.g., in the cases of coffee and cocoa, the length of the average production cycle including planting of trees). It is also explained by the cyclical nature of supply and demand relationships for a number of commodities, which suffer from a combination of low elasticity of supply and low price and income elasticity of demand. This phenomenon was of course captured

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in the celebrated Singer–Prebisch hypothesis dating back to the 1950s, which predicted a future of declining terms of trade for such exports.[1] The consensus view thereafter was that unless less developed countries move up and along the global value chains (GVCs) for these commodities and raw materials and/or diversify their economies away from an over-reliance on primary commodities, they will continue to suffer from low growth rates, high levels of poverty and deteriorating terms of trade. The hypothesis has led to a vast number of empirical studies, especially on African economies in order to test it.[2]

Since its founding more than 50 years ago in Geneva, the United Nations Conference on Trade and Development (UNCTAD) has always championed the plight of Commodity Dependent Developing Countries (CDDCs); those countries that rely on at least 60% of their total export revenue coming just a small number of key non-oil commodities. Many of these countries are in Africa. UNCTAD has commissioned a vast amount of research on this topic and has contributed greatly to an enlightened debate on the subject matter (see the many UNCTAD references at the end of this chapter). This literature, along with that of academics and other stakeholders (for example, the Common Fund for Commodities (CFC) based in Amsterdam and the Food and Agricultural Organisation (FAO) based in Rome) recognises that the risks faced by producers vary greatly between different commodities. These risks also vary from country to country depending on how important a particular commodity or group of commodities is to each country internally as well as according to the size of the producer within global markets for these commodities.

In a 2006 publication, the Common Fund for Commodities highlighted four main challenges that CDDCs faced in earlier years, and that still may apply today. These were: a structural over-supply of an undifferentiated product; erosion of trade preferences; proliferation of standards; and restructuring of GVCs. Not only are these factors still at work at the current time, the combination of all these factors operating simultaneously, though with differing individual impacts, represent a "perfect storm" for CDDCs. Although some of these changes may be desirable for other reasons, for example the development of product standards, coming during the same period as the other changes helps analysts of com-

modity markets understand and appreciate the endemic challenges that commodity producers face. Perhaps of critical importance is the impact of structural over-supply of the basic undifferentiated product. For many agricultural and raw material commodities, this factor represents an inherent obstacle that prevents them from moving up a particular GVC. In other words, the very nature of the product itself may be self-limiting. This applies particularly to tropical beverages such as tea and coffee, the production of which takes place in a large number of African countries. This point, and the need for African economies to diversify away from such commodities, is highlighted in this chapter, especially in the concluding section.

The research carried out by international organisations and individual researchers on commodities includes important work commissioned through UNCTAD's highly respected Special Unit on Commodities. This research has covered the following topics, inter alia: causes and consequences of commodity price volatility; commodity super-cycles; the role of smallholders; the emergence of commodity exchanges within some countries, including a number in Africa; market and regulatory reforms; and the financialisation of commodity markets, among other topics. The structural or inherent nature of the risks facing commodity producers includes the fact that small-scale producers (smallholders) will face greater challenges than larger producers. This is especially in terms of coping with "natural" or "catastrophic risks", for example due to weather and other causes such as pestilences. Knowledge and know-how are often lacking on the part of smallholders to be able to utilise the full range of market-based risk management instruments available to help them to cope with such risks. Since producers are prone to production risk as well as price risk from these natural events, the cost of insuring against adverse events can be prohibitive for many of them.[3]

A recent innovative development has been the creation of weather index-based crop insurance to help small producers. Through the use of weather stations and satellite technology, which avoids the need for assessments at the field level, producers are compensated whenever rainfall or temperature are too high or too low (in relation to a certain predetermined threshold) and crop yields are unduly affected. Such innovations are not without their drawbacks. For example, it must be possible to insure against

the risks themselves, and the index that is actually adopted has to be closely correlated with the underlying local yields. Moreover, the costs of setting up the appropriate infrastructure to assess the weather have to be shared between the producers, with possible support from government.[4]

Later in this chapter we provide a review of the different types of interventions within commodity markets in Africa and beyond. Some of these interventions have been market-based, others have been non-market-based. In the next section we review some of the official data on commodity price volatility from such organisations as UNCTAD, especially data that has special relevance to African countries.

5.2 What Does the Evidence on Commodity Price Volatility Tell Us?

A recent UNCTAD (2017) publication, indicates the diverse patterns of price movements (all domestic prices) for a variety of different commodity groupings, ranging from the so-called "soft" commodities such as cotton, to "hard" commodities like nickel, iron ore and zinc, the "tropical beverages" (tea, coffee and cocoa), and finally "liquid commodities" such as oil.[5] What is clear from this UNCTAD publication is that some commodities are subject to greater volatility than others (see Figs. 1, 2, 3, 6, 9 and 11 in the UNCTAD publication).

As already mentioned above, the factors explaining these price movements are complex and varied, and are often commodity specific. Leading commentators such as Nissanke (2017) have rightly suggested that most types of commodities have exhibited significant co-movements in their prices. In particular, Nissanke argues that recent movements in the commodity price cycle over many types of commodities were caused by a huge increase in the demand for some commodities such as oil and metals (and also for certain agricultural commodities) from fast growing countries such as China and India. Such co-movements can be seen in Figs. 1–3 in the UNCTAD publication. Nissanke (2017) also argues that low investment levels within commodity sectors in the 1980s and 1990s, along with falling commodity prices, may have contributed to what has become known as the "commodity super-cycle". This could have lasted

for almost 10 years and affected African economies in particular due to the nature of their commodity structure and only came to an end from the peak of 2011–2012. Since 2014 the prices of many commodities have fallen dramatically as a result of the slowdown in world growth (especially in such countries as China) and the major fall in oil prices in 2014–2015. African economies have been particularly badly affected, Zambia being a stark example, having experienced a dramatic decline in its principal export commodity, copper, during this period.

5.3 Commodity Dependence in Africa

The UNCTAD (2016a) publication "The least developed countries report 2016. The path to graduation and beyond: making the most of the process", highlights the particular plight of many African countries, which unlike other less developed regions of the world, remain locked into a high degree of commodity dependence. The report charts primary commodities as a share of merchandise exports by comparing the periods 2000–2002 with 2013–2015. Out of the 47 countries covered in the report, 32 are African. Some 15 of these 32 African countries have actually increased their dependency on primary commodities over this period, some of which significantly so (Sierra Leone, Madagascar, Liberia, Lesotho, Eritrea and Djiboui). The report also shows the share of primary commodities within merchandise exports by different commodity groups for the period 2013–2015. Once again, in a number of African countries, the shares of food items and agricultural raw materials still predominate (in Tanzania, Uganda, Somalia, Malawi, Guinea-Bissau, Gambia, Ethiopia, Eritrea, Comoros, Central African Republic and Benin).

As the report says, "Commodity dependence is driven mainly by agricultural produce in nearly half of the LDCs, and by minerals and fuels in many African LDCs" (UNCTAD 2016b, p. 20). According to the report, the African countries that relied heavily on minerals and fuels during the period 2013–2015 include: Angola, Burundi, Chad, Democratic Republic of Congo, Equatorial Guinea, Guinea, Liberia, Madagascar, Mali, Mauritania, Mozambique, Niger, Rwanda, Senegal, Sierra Leone, Sudan, Togo and Zambia.

The UNCTAD report also suggests that although during the 2000s increasing commodity prices stimulated high economic growth in a number of less developed countries (LDCs) including many in Africa, this was due more to an increase in prices rather than an increase in export volumes. Moreover, any growth in export volume tended to be outstripped by growth in imports, especially of food and fuel, which led to declining terms of trade for many of these countries and increased vulnerability to external shocks. Following the 2008–2009 financial crisis and the subsequent dramatic falls in many commodity prices, it is clear that many of these African CDDCs are extremely vulnerable to shocks out of their control. In essence this means that they can suffer twice. Firstly from the underlying volatility of their commodity prices. Secondly, from their inability to participate fully in the GVC for their commodities (see below).

A key question raised by these types of commodity dependencies is: What is best for these countries in terms of them being able to participate fully in the GVCs for their produce? Is a producer country that depends heavily on minerals and fuels more or less likely to participate fully in the GVCs for their commodities? Or is this more likely for a producer country whose dependency is based on food items and agricultural raw materials?

5.4 The Impact of GVCs: Impacts on African Producers

As the UNCTAD report points out, since GVCs have emerged in recent years, their impact on the countries that produce the commodities on which the GVCs ultimately depend, will vary from country to country and from commodity to commodity. The potential for CDDCs to "graduate" up and along the GVC will not be simple, inevitable, or automatic. As the report says, "The process of upgrading along a GVC is far from automatic and depends on a number of factors, including the input–output structure, geographic features and governance of the supply chain, and the interaction of these factors with the socio-economic and

institutional context of the host country" (UNCTAD 2016b, p. 24, based on Gereffi et al. 2005).

This list of constraints is a demanding one, especially for African countries. Of crucial importance are the socio-economic and institutional contexts of the host (producing) country, along with the governance structure of each particular commodity supply chain. The report goes on to say that where a producer country can provide an enabling and supportive governance and institutional environment, there may grounds for optimism. The report provides two specific examples of commodity sectors in Africa where such progress seems to have been achieved. These are: the apparel sector in Lesotho and Madagascar, which has benefited from the impact of regional or diaspora-owned firms—which have become more embedded than is the case in other countries that specialise in that sector. This has facilitated a higher level of upgrading along the GVC than if the sector had relied solely on foreign owned processing firms. Another good example highlighted in the report is the work of the international branch of the Diamond Trading Company in Botswana, which has been fostered and supported by the government of Botswana (e.g., in offering training programmes in gem-cutting and polishing of diamonds).

These two examples, one from the apparel sector and the other from the minerals sector, highlight the key point in our discussion of GVCs, that any progress made in the commodity's "graduation" process has tended to be country specific and commodity specific. It is quite a different story in, for example the fuel and mineral commodity sectors generally where, as the report says, "Fuel and mineral commodity value chains tend to be capital intensive, and LDCs are mostly confined to low-end activities" (UNCTAD 2016b, p. 24). Although a number of these producer countries have been able to exploit forward linkages in intermediate goods in relevant sectors of their economies, bottlenecks in the supply of engineering and chemical skills/activities, allied with, somewhat ironically, unreliable energy sources, have hampered progress for many countries in Africa.[6]

At the other end of the commodity spectrum, within agricultural sectors, there is a different bottleneck, as the report brings out. This is the dominant role played by smallholder farmers, especially in Africa who

cannot compete within these typically buyer-driven markets, which are often controlled by oligopolistic market structures. Such structures prevent the commodity producers/farmers from connecting to agricultural GVCs. The report gives the examples of the coffee and tea sectors (very important markets to a number of African countries such as Ethiopia, Kenya, Rwanda, Uganda and Tanzania), which are controlled by four transnational corporations for up to 60% of the total world market in coffee; and three companies that control as much as 85% of the world market for tea (UNCTAD 2015a).

Ponte (2002) uses a GVC approach to highlight the potential complexity of the chain in the coffee market. The more stages there are in the chain the more opportunities there are for inefficiencies and rent seeking. Ponte (2002) also refers to Gereffi and Korzeniewicz' 1994 classification of the four dimensions of global commodity chain (GCC) analysis, namely: the input–output structure; the geographic coverage; the governance structure; and the institutional framework. These are the ubiquitous frameworks through which national and international commodities policies tend to be shaped by globalisation. Ponte (2002) identifies the complex nature of the global supply chain (for coffee in his case) especially in light of market changes between the international coffee agreement (ICA) period (1962–1989) and the post-ICA regime period (1989-on).

5.5 A Brief Review of Market Interventions in Commodities and Their Relevance to African Countries

For many years economists and policy-makers have attempted to stabilise primary commodity prices through a variety of instruments. Varangis and Larson (1996) in a seminal paper divided them into three different types: (a) instruments that make commodity prices more stable; (b) instruments that make commodity prices (and revenues from commodities) more predictable; and (c) instruments that attempt to align expenditure on commodities with income from commodities.

In the first case, government price support schemes and ICAs were geared to reduce price volatility. Commodity derivatives instruments, which may include futures, options, swaps, and commodity-linked notes and bonds, are all examples of hedging instruments designed to make revenues more predictable. While the third group of instruments are the various compensatory financing schemes such as the IMF's Contingency Compensatory Finance Facility, as well as individual credit markets and savings mechanisms (including insurance schemes), which are actually designed to smooth the consumption expenditures of the commodity producers.

The third category of instruments, compensatory financing schemes, which try to deal with short-term declines in commodity revenues, tended to be ex-post interventions instead of being based on a system of ex ante price risk management. It is for this reason that commodity derivative instruments are now the preferred form of intervention to deal with primary commodity price volatility. They enjoy a number of advantages over the more traditional instruments discussed above.

Varangis and Larson (1996) set out these intervention advantages as follows: (a) they are based on market-determined prices rather than administratively based prices; (b) they have the potential to shift risk to third parties (e.g., brokers) which, because of their size and importance in the marketplace, are more able than producers or individual countries to bear the necessary risks; (c) it is possible to link them to specific financial instruments which reduces transaction costs and; (d) they are less costly than the traditional governmental price intervention schemes.[7]

For example, futures and options contracts are now available for a wide range of commodities, but they are not without their disadvantages. The main one is basis risk, where a risk remains that the locked-in price will not always completely cover the cost of the delivered product. For example, with food imports, the futures contracts are not always sold at a price that includes actual delivery of the product to the importing country. Call option contracts are preferable because, although they also lock in a maximum price, they do not carry the obligation to buy at the actual price. Rather, the government is still able to benefit from lower prices should that situation pertain. Call options effectively combine a price ceiling with price flexibility (downwards). Governments, of course, will have to pay non-refundable fixed premia for these options. In Africa, as

in other emerging markets of the world, there is a significant need for capacity building in the use of these market-based instruments. A crucial element of this is to support initiatives by organisations such as the UNCTAD and others to spread the good practice that has already been built up in countries where these facilities already operate more effectively (for example in Asia and Latin America).

At one level, it would seem that a greater reliance on the market mechanism would pass on more risk and uncertainty to producers and away from governments. Certainly, an outcome of market liberalisation within commodity markets and the development of these financial instruments may be that commodity price risks pass from government to the private sector generally. For many primary commodities, investment decisions have to be made long ahead of any actual production being realised. This is especially true for tropical products such as the beverage crops of coffee, tea and cocoa. However as Gemech et al. (2011) argue, the existence of a futures price for their product that they can know in advance should in principle improve the resource allocation of producers of these commodities. Without the availability of such derivative instruments, their profit margins would need to be much higher to protect them in the event of adverse price movements.

Alternatively, this intermediation role can be performed by governments on behalf of producers. In many countries the use of commodity derivatives instruments such as commodity bonds have been tried with some beneficial effects. In general there is now an increased momentum for producers, intermediaries, governments and exporters to participate in these derivatives markets. Now that domestic and international prices for many primary commodities are interlinked as markets become more integrated as a result of the creation of locally based commodity exchanges, the use of derivatives instruments, because they are based on a market-based risk management approach, can potentially benefit all market participants (see Sect. 5.10).

A crucial difference between the ICAs (and compensatory financing schemes) and commodity derivatives instruments such as futures, options and swaps, is that the latter are not designed to offer a mechanism to stabilise the national income of the country concerned. In essence, they reallocate risk between the various stakeholders, especially between trad-

ers, either within the country itself or overseas, and the producers. In theory, no risk is transferred to the governments in the producing countries, which is a major advantage in itself. Not least, does it prevent governments from rent seeking to exploit the complex interactions that can determine commodity transactions?

5.6 Financialisation of Commodities Markets

It has been argued by a number of economists that much of the recent volatility in commodity prices can be attributed to the increasing financialisation of commodities. Of course, this is not a new phenomenon, as Keynes highlighted in his 1942 work. However, as a consequence of a combination of such factors as: the growth in liquid commodity derivatives, which have allowed investors to hold commodities within their overall portfolios as a distinct asset class; and the effect of the 2008 financial crisis, which forced many financial institutions to diversify their portfolios away from equity and bond markets and into commodities, the negative impacts of financialisation may have become more acute.

Increasingly commodities as an asset class began to be viewed as "safe havens" for investment companies with surplus liquidity. This in turn led to the creation of a range of complex commodity-based financial instruments, an example being the development of commodity index funds which are aimed at providing a vehicle to facilitate speculation on price changes in commodity futures. Since these new financial instruments tend not to be based on the market fundamentals of supply and demand for individual commodities, their increased usage has contributed to even greater correlation in the prices of many commodities. Futures prices for commodities are often strong determinants of spot prices and they may no longer assist with price discovery and hedging of risk. As a consequence, especially as the process of financial innovation continues, the resultant effect on price volatility leads many stakeholders within commodity markets, including many small-scale producers, to no longer depend on the price signals that come from futures markets since they may bear little relation to the market fundamentals of supply and demand for individual commodities.

As already mentioned, a consequence of recent increases in price volatility for a range of commodities is that the policy option that is now increasingly favoured is to use financial derivatives markets. Within this context there has been much debate on whether financial speculation, as exemplified by non-commercial actors such as hedge funds, index funds and swap dealers, accentuates or diminishes the underlying volatility. In essence, this will depend on whether the derivatives markets are well functioning or not. Efficient futures or options markets can be expected to have a dampening effect on underlying volatility rather than an accentuating effect. Futures markets themselves carry out several different functions. They supply financial instruments to the market that can transfer price risk. But they also encourage a degree of price discovery by the various stakeholders among whom we now include those who supply commodities as a separate asset class for purely financial investors (e.g., fund managers).

In general, market participants can be classified as commercial or non-commercial (i.e., speculative). The former will use futures contracts to hedge their output against the risk of volatile prices. Their strategy tends to be defensive in nature. The latter, whose approach we may call offensive, are agents who buy and sell futures contracts with a view to taking on future price fluctuations in order to gain a risk premium. They are different from the commercial participants in these markets, such as the farmers, traders and processors, because they have no involvement or interest in the physical aspects of the trade. Often participants such as index and hedge funds will hold large futures positions in a range of primary commodities. Cocoa, coffee, sugar and tea are popular choices for such speculators.

A crucial role for such participants is that of price discovery, which involves the continuous reassessment of futures prices by buyers and sellers in response to new information that may become available. A key aspect of this role is that speculators provide market liquidity which otherwise might not be available. This allows commercial participants to locate counterparties at a lower cost than would otherwise be the case. The aim therefore is to achieve optimal levels of such speculative or "non-commercial" activity. Too much activity may lead to frequent and excessive price movements, such as may occur when speculators assume

that past price movements carry full information on future price movements—a process known as trend chasing, that is, buying after prices rise and selling after prices fall. Too little speculative activity may lead to low liquidity levels and excessive seasonal price movements. As a consequence of such possible effects, the need for appropriate levels of regulation across these markets—or at the very least greater transparency (e.g., in over the counter (OTC) markets)—is widely acknowledged.

At both international and national levels there is much on-going debate in organisations such as UNCTAD as to whether "regulators" can achieve greater transparency within markets.[8] UNCTAD, in a report published in 2009, highlighted how best to manage the financialisation of commodity futures trading, especially in light of the 2008 financial crisis. The report indicated that the substantial price hike that took place in 2007–2008, especially in food prices, and then the dramatic slump that took place in late 2008, suggested that financial investors (especially hedge funds) were increasingly using commodities as an asset class in their own right. This was particularly in evidence with regard to exchange-traded commodities. As the UNCTAD report argues, financial investors have in fact been active in commodity markets since the early 1990s, mainly through the use of swap agreements, which allow investors to adopt long-term positions in commodity indexes.[9]

The UNCTAD report shows that the trading volumes on commodity exchanges increased substantially during the above mentioned period of price increases, as indicated by a more than fourfold increase in the number of futures and options contracts between 2002 and the middle of 2008. The nominal value of OTC commodity derivatives increased in excess of 20-fold to USD13 trillion over the same period, only to go into serious decline from mid-2008. Such trends suggest strongly that large-scale speculation played a significant role in contributing to commodity price volatility during this period (Nissanke 2012; Mayer 2012).

Debate among economists on the impact of speculation on commodity prices has centred on the efficient market hypothesis (EMH), which states that prices in a free market will perfectly and instantaneously reflect all relevant and available information.[10] The UNCTAD 2009(a) report posits two reasons why this may not hold for commodity markets. Firstly, due to the fact that many of these products have low short-run price

elasticities of supply and demand means that in a rising market the absence of substitutes will cause consumers to accept higher prices. The market is cleared without the build-up of inventories since the number of counterparties with sufficient positions is insufficient (less than perfectly elastic). Unexpected large orders for the commodity may encounter liquidity problems with resultant price changes—sometimes called the weight of money effect.

The second reason why the EMH may not apply in commodity markets relates to the behaviour of different actors or groups in these markets. The finance literature makes a distinction between three types of traders: informed traders; uninformed traders; and noise traders. The second category, the uninformed traders, represents those market participants who collectively may be large enough and who can respond to information unrelated to market fundamentals. As a consequence they may misinterpret market signals significantly. Through their use of trend extraction techniques, they may end up generating the very market signals that as individual traders they respond to and follow.

Uninformed trading can be reinforced by other examples of herd behaviour, which is manifested by the involvement of managed funds in commodity markets. Such funds use a variety of technical analysis techniques (e.g., trend identification and extrapolation and algorithmic trading), which can accentuate the degree of short-run price volatility and can ultimately lead to overshooting of prices in these markets. There may even be a degree of spillover effects from other asset markets, since these traders will view commodity and other financial asset markets as part of a spectrum. The UNCTAD report provides graphical evidence of strong correlations between speculative activity across different asset markets that would not normally be correlated (for example between exchange rates and selected commodity indexes) for the years 2000–2008.[11] See also Tang and Xiong 2012.

Another consequence of such activities is that other traders may misinterpret short-term price effects. This has led commodity experts such as Gilbert (2008: 21) to suggest, "that the efficient markets view that uninformed speculation has no effect on market prices and volatility should be rejected". Therefore, the future is uncertain as far as the role of financial investors in commodity markets is concerned. It will depend on how active are the positions that these various types of actors take within these

markets. For index investors, the trading strategy has usually been determined heavily by specific market conditions (for example the existence, or otherwise, of a rising market). Other financial investors in commodities can often trade profitably against index investors, but with increased volatility this is likely to become more active than passive. This might lead to more rolling over of contracts or a greater focus on commodity exchange traded funds (ETFs), which are listed securities that are backed by either a physical commodity or a commodity futures contract.[12,13]

5.7 Alternative Derivatives Instruments: Policies to Reduce Commodity Price Volatility or Policies to Mitigate Commodity Price Volatility?

There are some key differences between the various derivatives instruments that can be used. Futures—swaps and commodity indexed bonds, which are contracts in which the principal or the interest payment or both are indexed to a particular commodity price—are different from options contracts, which provide the holder with the right but not the obligation to buy or sell a commodity at a particular price. Page and Hewitt (2001) present a useful overview of the various types of commodity derivative instruments and their various advantages.[14] It is important to distinguish between policy options that aim to reduce price volatility from those that aim to mitigate the effects of such volatility. From the producers' perspective, excessive volatility may not actually be as bad as permanently low prices, which can threaten household livelihoods. In general, uncertainty or excessive volatility can lead to below optimal production and investment decisions on the part of farmers and producers, especially when producers are highly risk averse (Gemech et al. 2011). However, the net outcome of such volatility and uncertainty also depends on the extent to which producers are themselves consumers of these commodities (as is the case with coffee in Ethiopia), as well as the percentage of household income that derives from particular commodities.

As Dercon (2004) and Dercon et al. (2005) have shown in studies on Ethiopia using a behavioural/experimental economics methodology, the

outcome will depend on how local producers respond to such shocks. Based on the seminal work of Kahneman and Tversky (1979), which highlighted the importance of framing, prospect theory and loss aversion (as opposed to risk aversion) within these various scenarios, it is important to adopt such an approach as a tool for understanding such decision-making under uncertainty. There is now a large empirical body of research, much of which is on African countries, which adopts this approach. Moreover, extra complexity is added in order to distinguish volatility in international prices from variations in domestic price movements. The transmission of global price movements to domestic markets (which is also affected by currency pass-through) is another factor to consider in this context.

The latter will also depend on whether production is protected in African countries via measures such as import duties, export taxes, as well as other non-tariff barriers/measures (NTBs and NTMs) and domestic price support mechanisms. It will also be influenced by market structure. For example, a monopolistic producer country may inadvertently insulate its domestic producers from the beneficial effects of higher international prices that are not transmitted to domestic producers, especially if the monopoly supplier (whether government or private sector) wishes to protect domestic producers from export instability. This is relatively common in a number of African countries, often for political or socio-economic reasons rather than purely economic ones. Other factors that can limit price transmission are the level of processing (or value-added within the supply chain) of some final consumption goods, and poor domestic infrastructures that can inhibit effective price transmission as a result of high transport and other transaction costs.

5.8 The Importance of Governance in Global Commodity Chains: How Can African Commodity Smallholders Survive?

As Kaplinsky and Morris (2000), Fitter and Kaplinsky (2001), Kaplinsky and Kimmis (2006), Gereffi et al. (2005), Keane (2012, 2017a, b), South Centre (2013) and Nissanke (2012, 2017) have argued, the response of

the various stakeholders within commodities markets to commodity price volatility (farmers, producers, regulators and governments) will ultimately depend on the governance and marketing structures of commodity GVCs. This is true within the producing countries themselves and, as the pace of globalisation continues, within the transnational companies (TNCs) who control and dominate the various links within these GVCs—from basic production to processing and on to the marketing of the commodities. (See Chap. 6 by Banini and Ghai on Africa's potential to upgrade within GVCs in this book.)

Within the producing countries too, many institutional and governance changes have occurred over recent decades. For example, market liberalisation, trade liberalisation and de-regulation, have radically altered the production and governance arrangements for many commodity producers, especially in Africa. This has been particularly true for a number of agricultural commodities such as tea, coffee, cocoa, rubber and cotton, among others. In particular, the joint impact of the scrapping of many of the ICAs (and income-stabilisation funds at the international level), along with the abolition of marketing boards in many commodity producing developing countries has meant that the producers as well as the traders of commodities have become more and more disconnected from their GVCs. Their places have been taken by TNCs.[15] Moreover, there is some empirical evidence that the combination of market reforms along with these institutional and governance changes may also have contributed to the increase in commodity price volatility. Gemech and Struthers (2007) found some empirical econometric evidence for this in their study of market reforms in Ethiopia in the 1990s and their impact on coffee price volatility.

Nissanke (2017) argues that these changes, internationally and at domestic levels, have combined to shift the balance of power away from suppliers to buyers of commodities in a form of "captive" or "hierarchical" form of governance in which rent seeking and capture is dominated by the large TNCs. One effect of this, as Nissanke (2017) points out, is a widening gap between producer prices and retail prices for commodities with many TNCs exploiting their informational advantages even to the extent of reducing producer prices to levels that barely cover production costs. Smallholder farmers or producers may have

been particular victims of these changes as highlighted in UNCTAD (2015b; 2016b).

Many of these small producers have been caught in the vacuum left by the scrapping of the ICAs and, due to their size, are often not able to benefit from the range of market-based risk management instruments discussed above. This includes those set up by international financial institutions and UN agencies such as the International Task Force on Commodity Risk Management (ITFCRM). As we have already highlighted, even if derivatives and futures markets can be called "efficient" (in the strict EMH sense), which is itself highly debatable, the high transactions costs and liquidity margins required to effect a market intervention hinder the participation of many small producers. There is also the problem that derivatives markets especially in futures and options, require strict standardisation of volume of commodities traded, along with very strict quality standards, some of which cannot be achieved by smallholders. Such restrictions and limitations often mean that small farmers and traders are only able to use these derivatives through branches and subsidiaries of the large dominant TNCs. Nissanke and Kuleshov (2013), for example, found in their study of a pilot risk-management facility for cocoa farmer cooperatives in Ivory Coast that their ability to hedge risk by using derivatives instruments was limited both in terms of cost and operational complexity.

In a recent UNCTAD study, "Cocoa industry: integrating small farmers into the global value chains" (2016b), the authors present detailed and convincing evidence of the obstacles faced by small farmers in this crucial sector for a number of African countries (especially West Africa). In addition to a number of recommendations at the macro and meso levels including: greater transparency in cocoa markets; more opportunities for small producers; and better competition law and policy at both national and international levels, the report also makes interesting recommendations at the micro level, where, after all, the key players—the farmers—operate from. These include: encouraging the creation of commercially oriented cocoa farmer-based organisations; improving farmers' ability to access price risk management instruments, some of which we have discussed above;

and crucially, encouraging more product differentiation by farmers so that they can receive higher prices. Such a granular approach is welcome and requires promotion by governments and other commodity stakeholders. Indeed, although this report is specifically about the cocoa sector, many of the recommendations could equally apply across other commodity sectors in Africa.

Fundamentally, the crucial choice that will have to be made by commodity stakeholders is whether to rely on such market-based risk instruments or to return to the type of non-market interventions carried out within the ICA's structure (buffer stocks and export quotas). As Mohan et al. (2014, 2016) have shown in studies of the coffee sectors in India and Ethiopia, the benefits of such non-market forms of intervention have to be offset against their costs (including regulatory), in a strict "welfare" calculation. Often, as found in these studies, the benefits from eliminating the volatility can be less than the costs of doing so using non-market interventions.

5.9 Commodity Price Volatility: A Principal–Agent Perspective

Struthers and Mohan (2013) and Struthers (2017) have argued that it may be appropriate to evaluate the various categories of interventions in commodity markets in terms of their efficacy in minimising the negative effects of the so-called principal–agent problem (see Jensen and Meckling 1976) The ICAs (especially commodity stabilisation funds and buffer stocks) were mechanisms used up until the late 1980s to stabilise commodity prices, as well as to increase their average (mean) price levels. These interventions were not only inflexible—due to the fact that many primary commodity prices are subject to long and variable swings—but also costly to implement, involving high transaction and other financial costs. Invariably the costs of such interventions were borne by the producers and governments. No ICAs currently still exist, despite the fact that in their heyday they were numerous and covered most, if not all, of the primary commodities (Gilbert 1996).

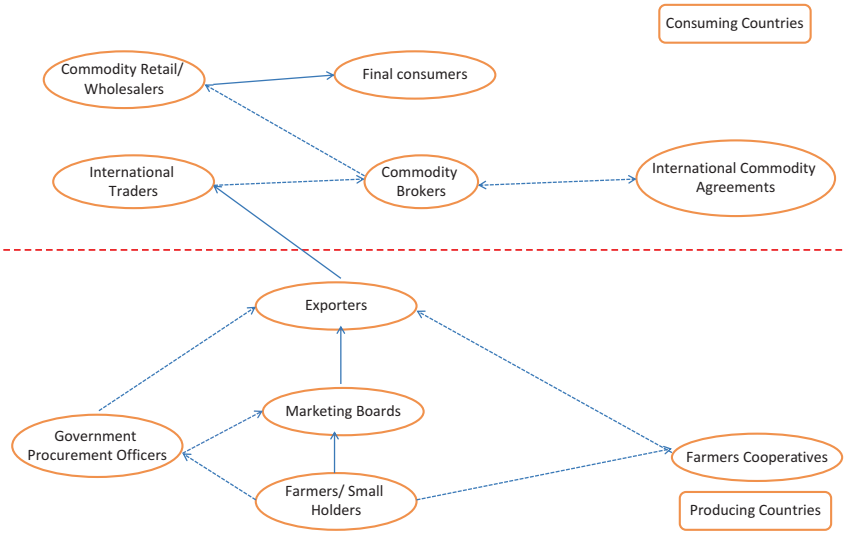

Fig. 5.1 Principle–agent relationships (before market liberalisation). (Source: Author)

The demise of the ICAs can be analysed in terms of the principal-agent problem. Indeed, this perspective, since it is based inherently on issues of governance, asymmetric power and information asymmetries, may be viewed as a further insight into the challenges and obstacles that lie at the centre of the GVC approach, in the work of Gereffi et al. (2005) and Ponte (2002)—see Figs. 5.1 and 5.2. The conflicts between producing and consuming countries within complex supply/value chain issues, which can hinder agreements between the parties, can be analysed within a principal-agent paradigm.

For example, prior to the market reforms in the commodity markets we have mentioned above, within producing countries marketing boards played a significant role in these markets. We can refer to the boards as the principal, and the producer (farmer) as the agent. Since marketing boards no longer play such a dominant or indeed (for many commodities) any role, it is likely that the international trader (exporter) will be the principal and the producer (farmer) will be the agent. However it is more complex than this. principal–agent relationships can change and evolve over time. It is possible, indeed likely, that individual market

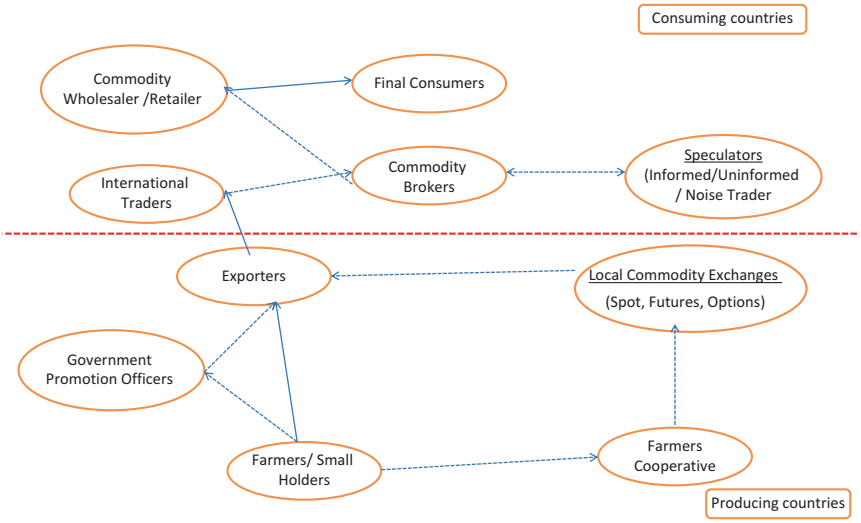

Fig. 5.2 Principle–agent relationships (after market liberalisation). (Source: Author)

participants can be both principals and agents according to their different roles and position in any particular GVC. Moreover, these changing and overlapping roles will be influenced by market liberalisation and the development of price-risk management instruments (including formal commodity exchanges). It is possible, as Struthers and Mohan (2013) and Struthers (2017) have argued, that the principal–agent problem may have become more complex after market liberalisation (see Figs. 5.1 and 5.2).

Pre-market liberalisation, the principal–agent problem is complex enough, as shown in Fig. 5.1, and applies within the producing countries (see the bottom half of the figure) as well as in the consuming countries (see the top half of the figure). The potential for multiple (overlapping) principal–agent relationships exists, for example between importer, market brokers and final consumers. Pre-market liberalisation, the ICAs were the international equivalent of the domestic marketing boards since they operated as physical market trading entities (for example within the ICA). It could be argued that commodity markets during the pre-liberalisation period were controlled by a type of bilateral monopoly, with marketing boards exercising dominant control in the

producing countries and the bodies involved in the various ICAs doing the same within the consuming countries, albeit with potentially greater power than the domestic marketing boards.

Post market-liberalisation, the principal–agent problem arguably becomes more complex, as can be seen in Fig. 5.2. The domestic context for commodity producers became less complex due to the disappearance of the marketing boards, which acted as intermediaries between the producers and the exporters. However if this is combined with the demise of the ICAs at the international level, there is now the impact of speculators to consider. As a consequence of market liberalisation, it can be argued that domestic intermediaries have simply been replaced by new (international) intermediaries in the form of brokers and speculators.[16]

The complexity of all of these principal–agent inter-relationships will be compounded by the inherent supply/value chain complexities that exist in particular commodity markets and which will vary from commodity to commodity and from country to country. It would seem that there is now greater potential for the negative effects of the principal–agent problem to stem from the consuming countries rather than the producing countries compared with the situation when commodity markets were regulated by ICAs. In the consuming country it may be the international buyer who now plays the role of principal. The development of well organised local commodity exchanges might mitigate this shift of power away from the producing countries to the consuming countries. Struthers (2017) argues this is possible within a principal–agent context and has developed a taxonomy to calibrate the costs and benefits of different governance arrangements within a principal–agent framework using indicators such as risk aversion and transaction costs, among others.

5.10 From ICAs to Commodity Exchanges: An Example from Africa

It is clear from the discussion above that derivatives commodity instruments will not eliminate all obstacles facing various stakeholders in commodities markets. This is one reason why an increasing

number of producing countries have established their own commodity exchanges with the aim of providing local participants (especially the producers/farmers) with improved access to these instruments. One effect of this is that basis risk and exchange risk can be lowered, providing there is sufficient liquidity in these markets to also lower transactions costs. Such local provision of commodity exchanges requires not only an efficient spot market for the commodity, but also effective infrastructural provision, including transportation, communication and information. Most important of all is the provision of sufficient capital to enable a viable clearing house to deal with counterparty risk.

In recent years agricultural commodity futures exchanges have been established in a growing number of emerging and developing economies such as Brazil, China, India and South Africa, as well as an increasing number in African economies. Originally, prices within these exchanges simply mirrored those in developed country exchanges. More recently, however, there has been increased trading in locally based exchanges, which facilitates the avoidance of exchange rate risk as well as basis risk. Commodity exchanges in developing countries (for example in India, Ethiopia and Malawi) may have reduced the negative outcomes of some of the principal–agent problems discussed earlier. For example, to the extent that long-term relationships can be more easily developed between the producers and these exchanges, this can be expected to reduce goal conflict (increase incentive compatibility) between principal and agent. However, this will also depend on the extent to which the local commodity exchanges are able to convince the producers to adopt a more output (targets)-based approach to production and move away from a behaviour-based approach.

This favourable outcome will depend on whether the local commodity exchanges can develop a sufficient presence in producing countries to avoid the problem of markets that are too thin and as a result are hindered by low levels of liquidity. The crucial role of information dissemination has been well documented by academics and international organisations such as UNCTAD (2009b). The hope is that effective commodities exchanges will be able to play an increasingly significant role to help producers for example in price discovery. For a discussion of

a commodity exchange in Africa, which has been held up as an example of good practice, see the Appendix to this chapter which outlines the operation of the Ethiopian Commodity Exchange (ECX).

5.11 Conclusions and Future Commodity Prospects for African Economies

The role of price-risk management instruments as a solution to commodity price volatility has rightly received much attention from academics and international organisations such as UNCTAD. While these instruments are not without their limitations, they do offer a way forward for producing countries to at least mitigate the effects of price volatility. The evidence suggests that they do very little to suppress the underlying price volatility for primary commodities. Rather, they should be viewed as tools for alleviating the uncertainty of the revenues that derive from these commodities. After all, futures prices themselves have been shown to be as volatile as the underlying spot prices, as we discussed above in relation to the EMH. Moreover, no matter how efficient these instruments might be (in an EMH sense) their short (a maximum of two years) time horizons make them less suitable for primary commodities with gestation periods of longer than two years (for example some of the tropical beverages among African producers such as coffee, tea, and cocoa). However, the key message from this chapter is that these instruments, especially properly managed and funded commodity exchanges such as that in Ethiopia, may achieve a level of incentives compatibility. This is quite different from the effects of the traditional stabilisation instruments discussed in this chapter, which were often beset by goal conflicts between the agents and the principals. Effective and efficient commodity exchanges will not eliminate principal–agent goal conflicts, but they will at least mitigate the worst effects of these conflicts, especially in minimising rent-seeking behaviour. This principal–agent perspective should be considered a complementary approach to the market efficiency approach, which has traditionally dominated research on commodities and perhaps deserves to receive more attention from academics and policy-makers alike.

There remains of course a dilemma for academics and international organisations to resolve in their analyses of potential solutions to the endemic problem of commodity price volatility faced by developing countries, especially in Africa. While on the one hand it is appropriate to develop new and innovative instruments such as commodity derivatives and commodity exchanges to mitigate the effects of price volatility, it is equally important for producing countries to seek to diversify their economies away from commodity dependence (as defined earlier in this chapter by UNCTAD). This requires such countries (and many in Africa are now achieving some success in doing this) to move up the supply chain or GVCs for their commodities—to achieve graduation in the words of the UNCTAD report referred to in this chapter—but at the same time reduce their dependency on just a few commodities. Achieving this is not easy and requires judicious choice and utilisation of the relevant economic policy tools open to governments, including those at the macroeconomic level. This is especially difficult if we recall the discussion in the very first section of this chapter, which outlined the many different types of risks faced by CDDCs, including severe weather conditions. However the example of Ethiopia is perhaps illustrative here if we realise how effective the country has been in reducing its dependence on a single commodity—coffee—which in the 1980s and 1990s accounted for as much as 60% of all of its export revenues. That figure is now down to around 40% and the economy has been able to diversify significantly. This is perhaps a lesson that other CDDCs in Africa might be able to learn from.

Appendix: Case Study, Ethiopian Commodity Exchange (ECX): Source: Adapted from ECX Website (http://www.ecx.com.et)

The ECX was established in 2008 as a public–private partnership enterprise. The government of Ethiopia owns the ECX. The ECX issues membership seats for sale. These are privately owned and can be freely transferred against any earnings derived from trading on the exchange. The commodities traded on the exchange are: coffee, sesame, haricot beans, wheat and maize.

One of the key strengths of the ECX is that it is structured as a demutualised corporate entity with a clear separation of ownership, membership and management. In principle, owners cannot have trading rights and members cannot have ownership rights. The management cannot be drawn from the owners or from the members.

Membership

Membership is acquired through the purchase of a membership seat, and gives a transferable right to trade on the exchange.

Trading Procedure and the Role of Warehouse Receipts

Commodities are deposited in warehouses operated by ECX in major surplus regions of the country.

At the ECX warehouses, commodities are sampled, weighed, graded and certified. The ECX guarantees the grading of the commodities and maintains a central registry of warehouse receipts. The ECX provides standardised ECX commodity-based contracts, which specify grade, delivery location, lot size and other contract terms. The contracts can be either for immediate delivery or at a pre-specified date in the future. In 2012, ECX introduced electronic warehouse receipts, which help members to secure collateral finance.

ECX Trading System

The ECX trading system uses a physical trading floor located in Addis Ababa. Here buyers and sellers engage in "open outcry" bidding for commodities. Market prices can change throughout trading hours. These prices are transmitted in real time to producers and consumers by electronic price tickers, which were initially located in 21 locations around the country, although the ECX's aim is to increase these to 200. The prices also appear on the ECX website (http://www.ecx.com.et) and via a mobile phone service.

ECX Mechanisms of Reduction of Transaction Costs and Co-ordination Risks

A clear aim of the ECX is to reduce transaction costs and other risks for those who participate in commodity markets in Ethiopia. The ECX website says that this is achieved through the following.

Market order is enhanced via an organised trading platform, formal rules and procedures. Contracts are standardised, as are the commodities. Along with the system of membership-based participation, this facilitates monitoring and enforcement of compliance to the rules, and helps to mitigate risks in the market.

Market integrity is achieved through grading and certification of the quality and quantity of commodities, along with warehouse receipting of commodities traded. A touchstone of the ECX is to achieve fair competition, ethical business and efficient clearing of all payments between buyers and sellers.

Market transparency is achieved via a system of industry-accepted product grades and standards, dissemination of market information that is speedy and reliable to all participants, as well as effective disclosure and audit reporting requirements for members.

Market efficiency is enhanced through effective use of information technology to facilitate the end-to-end system, that is, from warehousing, trading, clearing and settlement of payments to delivery of the commodity.

The essence of the ECX is that it is a centralised low-cost trading platform where warehouse receipts along with quality and standards play key roles. There are also other benefits.

- Since the physical transfer of the product is made only after the commodity is sold, this reduces transportation costs.
- A market information system also exists within the ECX in order to increase accessibility to different markets and also to the general public through different media.

In summary, the whole framework is designed to assist in the process of price discovery for farmers and producers through the key roles of members.

A number of empirical papers have been written with the aim of assessing the performance of the ECX against its own objectives. For example, Andersson, Bezabih and Mannberg (2015) studied the impact of the ECX on market efficiency in Ethiopia, specifically whether regional warehouses that are connected to the national commodity exchange in Addis Ababa reduce transaction cost and price dispersion between regions. For the period 2007–2012, they found that the average price spread was reduced significantly as more regional warehouses were established across the country. In another study, albeit over a more limited time period and only with reference to sesame production, Alemu and Meijerink (2010) did not find similar reductions in transaction costs. Similarly, Worku et al. (2016) found in a survey of exporters that the grading and sampling system of the ECX suffered from bias, lack of technical knowledge and equipment. They also found that some distrust existed between the seller, buyer and the ECX. This was attributed to the high penalty cost imposed by the exchange for delaying or withdrawing commodities as well as the perceived high membership fee. There is a need for further empirical studies to assess the performance of the ECX, in particular a time series analysis, as relevant data builds up going forward.

Notes

1. The Singer–Prebisch hypothesis became the capstone in these early years to highlight the endemic problem that less developed countries faced with declining terms of trade as long as they continued to rely heavily on primary commodities for their export markets (Prebisch 1950, 1959, 1964; Singer 1950, 1958, 1975, 1982).
2. *Economies of scale (*and *scope*) are vital in commodities markets. Commodity producers are either characterised as *latifundia* (a small number of very large-scale producers); or *minifundia* (a very large number of extremely small producers). *Minifundia* are more common in

African economies. A relevant example is the very large number (in the hundreds of thousands) of small coffee farmers/producers in Ethiopia.

3. Papers by Dercon (2004); Dercon et al. (2005); Morduch (1995) analyse a range of different shocks that can adversely affect vulnerable countries (e.g., Ethiopia) as well as the necessary consumption and income smoothing aspects of these shocks.
4. The Food and Agricultural Organisation (the FAO) has been active in developing "*early warning systems"* to be able to anticipate and respond to severe weather disturbances such as drought, famine and hurricanes, which can of course threaten life on a huge scale. The FAO has also facilitated the setting up of an effective *agricultural management information system* (*AMIS),* which tracks food outputs and yields across the world. It is an inter-agency platform aimed at enhancing food market transparency and security. It was set up in 2011 by the G20 ministers of agriculture after the major increases in global food prices in 2007–2008 and 2010. It incorporates the main producing countries of agricultural commodities and monitors global food supplies. It concentrates on wheat, maize, rice and soybeans and is effectively a platform to co-ordinate policy responses during periods of market uncertainty and volatility. According to the FAO website, its coverage of global production, consumption and trade volumes in the above crops may be as much as 80–90%. Although its main function is to ensure better global food security, it can also help to anticipate and hopefully mitigate agricultural commodity price increases, especially in these vital food crops.
5. "*Commodity Dependence and the Sustainable Development Goals: Note by the UNCTAD Secretariat"* prepared for the multi-year expert meeting, ninth session, in Geneva on 12–13 October 2017.
6. Two other examples from a recent Commonwealth Secretariat publication edited by Keane and Baimbill-Johnson (2017) are also illustrative of the potential to move up the value chain (see Keane's article on the cut-flower sector in Kenya and Ethiopia, where some upgrading was discernible, especially in the context of Kenyan firms entering the Ethiopian supply chain; and the paper by Nana Asante-Poku in her analysis of Ghana's participation in the pineapple GVC). In the former case, the upgrading that took place was largely based on the different tiers of suppliers prevailing within the Kenyan market and to some extent within Ethiopia, as well as Kenyan lead firms who are active in Ethiopia. In the paper it is referred to as a "flying geese" model. In the latter case, progress has been more erratic, which the author attributes to a combination of

institutional changes and an inconsistent response on the part of producers to significant events such as the development and introduction of new product varieties.

7. We suggest in Sect 5.9 of this chapter further advantages of these derivatives instruments in terms of a *principal–agent* approach. These derivative instruments achieve a *better incentives compatibility (avoidance of goal conflict)* for farmers, intermediaries, distributors, large retailers and consumers alike. They achieve this by reducing the potential for *rent-seeking* behaviour on the part of these various stakeholders. A practical example of this incentives compatibility is the provision of a credit line to producers, which can then be drawn down in line with what happens to underlying commodity prices. When prices rise (fall) interest payments on the loan will rise (fall). A symmetry can therefore be established between the underlying economic activity, the production of the commodity itself and the financial means (in the form of credit facilities) that will assist in the production of the commodity which, in turn, can assist in the purchase of needy fertilisers, replanting of crops, etc.
8. Some possibilities are: the setting of speculative position limits on commodity futures contracts to minimise the potentially volatile effects of excessive speculation (for example, arising from short-trading); the setting of maximum limits on daily price changes and on inventories held by non-commercial participants to reduce excessive volatility; the introduction of volume and frequency trading limits; and attempts to ensure international consistency across exchanges in order to prevent regulatory arbitrage. However, it is still early days as to whether such initiatives have been effective, especially in Africa (UNCTAD 2009a).
9. Two prominent examples of these indexes are: the *Standard and Poor's Goldman Sachs Commodity Index (S&P GSCI)* and the *Dow Jones American International Group Commodity Index (DJ-AIGCI).* These are composite indexes of weighted prices of a range of commodities, which includes energy products, agricultural products and metals.
10. See Mananyi and Struthers (1997) for an econometric study of the EMH in the market for cocoa futures.
11. See Table 6 of the UNCTAD (2009a) report.
12. A contrary position on the efficacy of financial derivatives markets is presented by Breger-Bush (2010) in her study of the use of price-risk management instruments for coffee farmers with specific reference to Mexico and the 1998–2002 coffee crisis. Her argument is that it is ambitious of international organisations such as the World Bank and

UNCTAD to recommend such instruments for small-scale producers. The basis for her argument is that the use of derivatives for hedging can create *direct* and *indirect costs* for small farmers in terms of actually contributing (as opposed to offsetting) the destabilisation and reduction of farmers' incomes. She also argues that support for such instruments carries *high opportunity costs* in terms of other more relevant and effective risk management schemes that will support small coffee producers who face volatile commodity prices. Her argument is that futures hedging can lead to small coffee farmers' incomes becoming more unstable, because they are less well capitalised to be able to meet the required margin calls with their low level of reserves. Moreover, she argues that they may cause chronic oversupply in these markets, which can accentuate the plight of small farmers. This may be due to the incentives provided to producers to increase output. A crucial element in her argument is that the required combination of "*initial margin*" along with the subsequent "*maintenance margin*" in the context of a daily "*mark to market*" accounting mechanism will put undue pressure on small farmers to keep their positions open. In essence, a futures hedge that may be profitable over relatively long periods, such as a year or two, might be unprofitable day to day, week to week or month to month. The opportunity cost that Breger-Bush (2010) refers to is the lost opportunity that an excessive focus on futures hedging may produce in terms of foregoing alternative approaches such as: more *effective supply management* and *Fairtrade*. However, a fuller discussion of these alternatives is beyond the scope of this chapter.

13. One study by Benavides and Snowden (2006) has suggested that the use of futures markets may not be taken up by farmers or producers as extensively as may be thought. In a study of the Mexican corn scheme, Benavides and Snowden discovered that low take up of corn futures and options in the late 1990s was due to rational calculations on the part of farmers rather than inertia. This was seen in terms of the benefits to them from participating in the scheme sponsored by the Mexican government to facilitate access by farmers to futures and options contracts traded on various US commodity boards such as the New York Board of Trade (NYBOT) and the Chicago Mercantile Exchange (CME). Within a cost-benefit and break-even framework, the authors discovered that the hedging costs (implicit in the subsidy given by the government) were very similar to the farmers own estimates of their "*price of risk bearing*", which meant it was not worthwhile for them to participate, at least on the scale that was hoped for.

14. See Table 5 in Page and Hewitt (2001).
15. One exception to this general trend is the continuing role of the Ghana Cocoa Board in Ghana, which effectively acts as a marketing board for the production, processing and marketing of cocoa in that country.
16. Rashid et al. (2010) have suggested that the development of domestic commodity exchanges in many African countries is impeded by the small size of their domestic commodity markets, poor physical infrastructure and inadequate legal and regulatory environments. For these reasons, they argue that the development of regional exchanges might be a better option for such countries, alongside a focus on improving investment in transportation and other physical infrastructure (for example, warehousing and improved information services). (See Chap. 9 by Eba and Struthers in this book for a discussion of the potential for establishing a regional commodity exchange in West Africa).

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6

Does Africa Have What It Takes to Upgrade in Global Value Chains?

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6.1 Introduction

Trends in international trade in the last few decades have been driven by globalisation, which is in turn spurred by major new developments in information and communication technologies (ICTs), and logistics, and greater trade liberalization. World trade in goods and services has increased steadily since the 1990s. From 1980 to 2016 trade in goods increased from USD 2 trillion to more than USD 15.7 trillion; and trade in services from about USD 2 trillion to over USD 20 trillion (UNCTAD 2017). Manufacturing processes and services that make up "value chains" are increasingly distributed strategically across the globe, with countries relying more and more on assembling imported intermediate goods for

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their own exports. These complex international production arrangements have been conceptualised as global value chains (GVCs). In practice, GVCs incorporate the full range of functional activities entailed in the production of a product or a service from its inception to final use, and how these activities are distributed over a range of countries (Sydor 2011; 2013a). As such, they engender a dynamic multipolar political economy in which countries compete to create and retain rents (Kaplinsky and Morris 2008).

Intermediate goods and services, which are introduced at any stage of the value chain, are increasingly capturing a greater proportion of world trade. In just about a decade, the values of this category of goods grew from below USD 4 trillion in 2004 to approximately USD 7.5 trillion in 2014 (UNCTAD 2014). However, participation in GVCs is uneven across regions and does not necessarily reflect a region's participation in global trade. Global value-added trade is concentrated in three regional blocks (Asia, America and Europe), which represent 85% of the GVC trade. By comparison, despite a 60% increase in trade from 1995 to 2011, Africa's share in global value-added only accounted for 2.2% in 2011 (UNCTAD 2013a). This small share in GVCs is partly due to the continent's participation being limited to the lower segments of GVCs, primarily supplying commodities to which value is added (that is, transformed) in other regions.

As more and more trade is conducted through these chains, there are significant implications for regional integration, trade performance and general economic development in Africa. A question that often arises is whether GVCs are an answer to Africa's development conundrum. The objective of this chapter is to examine the critical components of GVCs in relation to African trade, and evaluate the continent's capacity to meet the requirements for upgrading gainfully in these chains. As such, it attempts to identify the type of policies that would facilitate the continent's greater participation in GVCs in a manner that leads to sustainable growth and development, including employment creation.

The chapter contends that considering the structural constraints of Africa, policies to promote GVC participation cannot simply be grafted onto its economy. Comprehensive development policies are necessary to

address these constraints in order to promote intra-African trade as a basis for regional value chains (RVCs), through which the continent could develop its comparative and competitive advantages to position itself in GVCs gainfully.

It must be said from the outset that it is a daunting task generalising about Africa, a continent comprising 54 different countries, with a relatively richer north (in GDP per capita terms) and a poorer sub-Saharan Africa (SSA), excluding South Africa. Thus, the analytical insights might not apply with the same force to all these countries, or equally to the North African and SSA countries. In addition, there is so much heterogeneity in economic performance among countries: a few countries (Botswana and Mauritius) have long been good economic performers, to which another group of countries of "above-average economic performance" might well be added. Examples of the later include countries such as Kenya, Angola, Ethiopia, Rwanda, Nigeria and Ghana, even if their performance has not been consistent.

The next section discusses briefly Africa's position in GVCs, while Sect. 6.3 analyses Africa's participation in global trade in relation to manufactures and services, which dominate GVCs. It also attempts to identify what factors affect Africa's participation in trade and GVCs: does Africa have what it takes to participate in GVCs? The penultimate section explores the implications of the emergence and preponderance of GVCs for Africa's development, how the continent could utilise GVCs to meet its development priorities, and what sort of policy framework would be conducive for upgrading capacity to enhance its participation in GVCs. The final section concludes.

6.2 Africa and GVCs

Much of Africa in the immediate post-colonial period (1960s and early 1970s) attained positive and, in several cases, sustained robust growth rates in output. These gave way to the economic collapse of the late 1970s, paving the way for the structural adjustment programmes (SAPs) of the 1980s and 1990s. Since the mid-1990s, however, African countries

have experienced a moderate growth in output, but this has been episodic with high growth rates punctuated by low and sometimes negative growth rates, resulting in an average annual growth rate of 2.6% (1990–2000) compared to 1.8% in the preceding decade (1980–1990) (UNCTAD 2014b). This all changed at the beginning of the twenty-first century with the continent sustaining a robust average annual growth rate of 5% (2000–2010), although its per capita growth rate has been much slower at 3%; and the continent's share in global GDP at roughly 3% in 2015 is no different from what it was in 1970.[1]

Economic performance in the 2000s, as in the 1970s, has been on the back of higher commodities prices and, to a limited extent, volumes traded. Another similarity between the two periods is that Africa has been unable to utilise revenues from its commodities exports to structurally transform its economies. One school of thought thus contends that unless, and until, Africa undergoes a structural transformation, it will continue to export agricultural commodities, minerals and petroleum, which currently dominate its export basket. The "Africa Rising" school, on the other hand, believes that the good economic performance of the continent since the turn of the century has launched the continent onto a sustained growth trajectory. Whichever of these two competing schools one subscribes to, the indisputable fact is that Africa continues to be marginalised in global trade.

Africa's share in exported added-value is very small (Banga 2013, OECD et al. 2013), although it has been argued that the continent is a large volume exporter and tends to be heavily integrated into GVC compared to other developing countries (Mc Gregor et al. 2013). While this is true, one should caution that this is *forward integration* based on raw material exports. The benefits of this type of integration are less clear and certainly smaller than not only those of *backward integration*, but also of forward integration *based on innovation or research and design* both of which are critical to the continent's industrial development. Other scholars (e.g., Gibbon and Ponte 2005) argue that GVC success stories among African countries did not involve upgrading to more advanced and remunerative activities that serve niche markets, but rather "trading down" to simple, labour-intensive activities that serve mass markets.

These competing views on Africa's position in GVCs notwithstanding, there is a consensus that GVC *management and power* are critical in what share of the total value generated goes to the participants along the chain. The benefits from value chain participation are by no means equitably distributed among countries, and several countries have found themselves trapped at the bottom of GVCs (Banga 2013; Morris et al. 2012; Cheng et al. 2015; Conde et al. 2015; and Gibbon 2001…). This concentrated distribution of value added has been underscored by a recent study using Organisation for Economic Co-operation and Development-World Trade Organisation (OECD-WTO) Trade in Value-Added (TiVA) data. It has been estimated that OECD countries capture 67% of value created in GVCs; the BRICS economies (Brazil, Russia, India, China, South Africa) and a handful of economies from East and South-East Asia capture 25%; leaving the remaining 100+ developing countries to share the balance of 8% of value-added in GVCs (Banga 2013).

Despite this, there is growing literature that suggests that countries that participate in value chains enhance their comparative advantage in various tasks, through technology transfers and cost savings which in turn translate into productivity increases, greater sophistication and diversification of export baskets and greater overall economic benefits (UNCTAD 2013a; Conde et al. 2015; Cheng et al. 2015). Africa's greater integration into GVCs could thus be an engine to higher levels of growth and development, spurring investments in infrastructure, agriculture, industry and services, including information and communication technology (ICT) and domestic resource mobilisation. The continent cannot realise these benefits if it remains trapped at the lower levels of GVCs, hence the need to upgrade.[2] To upgrade successfully and gainfully, Africa has to overcome several challenges in terms of weak institutions, infrastructure, power or energy supplies, and skills. Other challenges include, traceability systems, standards, certification and policy framework, and customs and border management, including efficient port management. A major prerequisite will be an overarching policy context that is stable and predictable, underscored by a stable political system.

6.3 Africa's Participation in Global Trade and GVCs: Why Such a Small Share?

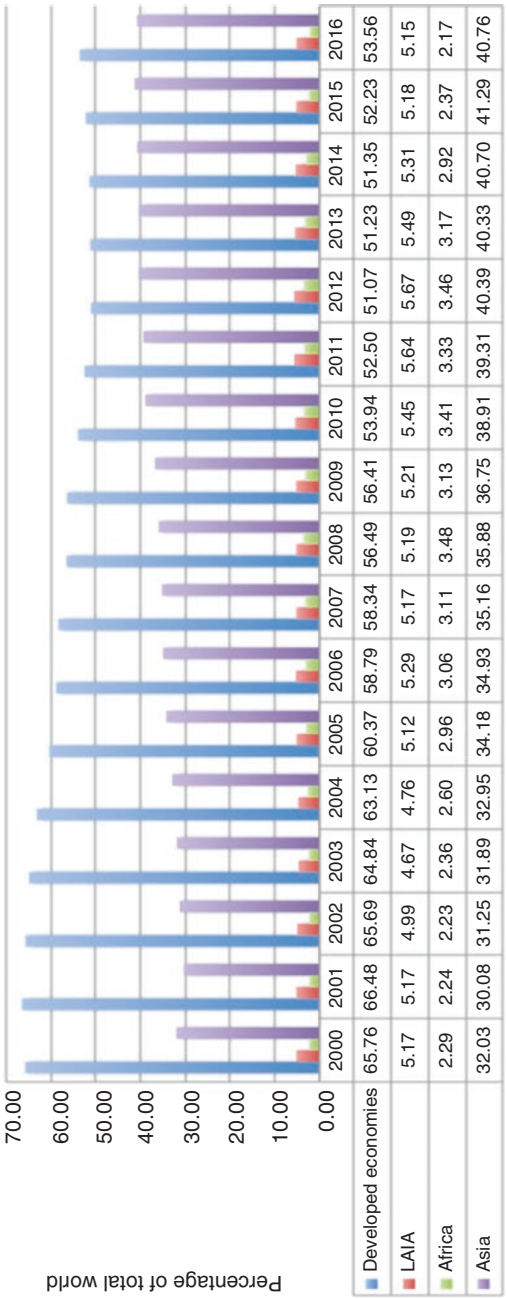
Primarily, Africa has been unable to take advantage of GVCs because its participation in global trade is low and much of this trade is limited to raw materials to which it adds little or no value—that is, *forward* integration.

Growth in Africa's merchandise trade (exports and imports) has kept pace with growth in global trade over the last decade or so, with a real export volume growth at 5.2% (2007–2011) exceeding the global average of 4.8%. However, this rate is below the average growth rates of developing Asia and other developing economies of 8.8% and 7.8% respectively over the same period (UNCTAD 2013b). The continent's share in global trade has remained more or less stagnant, hovering around 2–3%, over the past three decades and showing a steady decline from about 6% in 1980, making it the least successful trading region in the world (see Figs. 6.1 and 6.2).[3]

Broadly, much of the continent has remained a major exporter of raw materials (tropical/agricultural products, fuels, ores and metals), with manufactures, on average, accounting for less than one-fifth of total exports.[4] The fall in the prices of these commodities resulted in a significant decline in Africa's export revenues of 11.5% (from USD 388.7 billion to USD 361 billion) between 2015 and 2016 compared to a global export revenue decline of just 3.2% (Figs. 6.3 and 6.4).

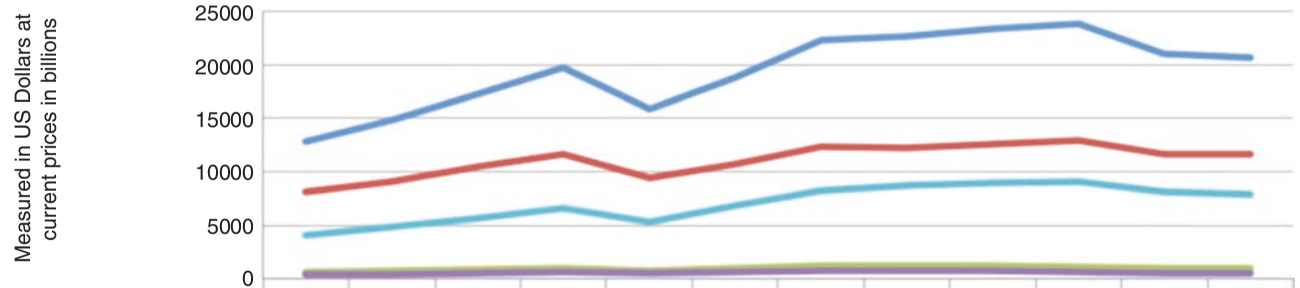
The recent growth spurt has been fuelled by large price and—to a limited extent—volume increases in the exports of unprocessed minerals and fuels, rather than in processed commodities. The continent's manufacturing sector (excluding countries such as, South Africa, Mauritius and, to some extent, Algeria, Egypt, Morocco and Tunisia in North Africa) has remained relatively small. Its share in total global manufacturing exports is currently less than 1%. The share of manufacturing in GDP has fallen since the mid-1970s and has stagnated at around 10% since 2008 (Fig. 6.5).

Growth rates of manufacturing increased from an annual average of 0.2% (1990–2000) to 5% (2001–2008) and then to 7.6% (2009–2014).



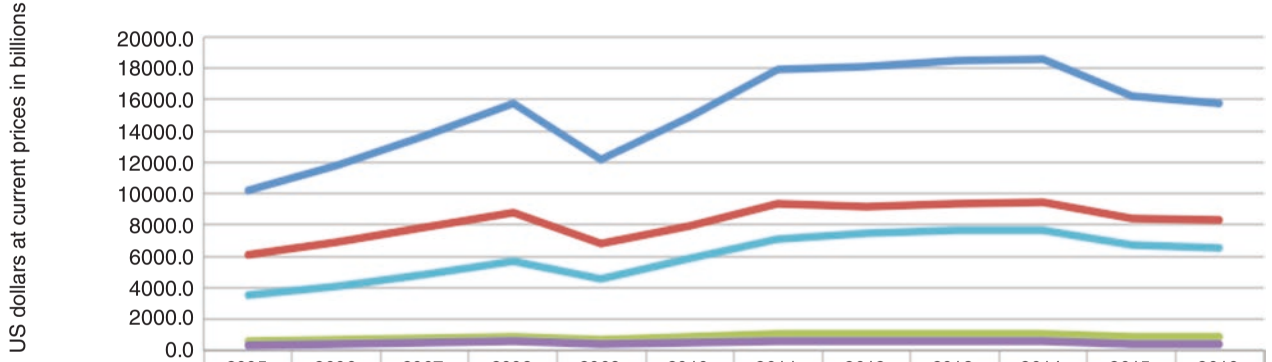
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Developed economies	65.76	66.48	65.69	64.84	63.13	60.37	58.79	58.34	56.49	56.41	53.94	52.50	51.07	51.23	51.35	52.23	53.56
LAIA	5.17	5.17	4.99	4.67	4.76	5.12	5.29	5.17	5.19	5.21	5.45	5.64	5.67	5.49	5.31	5.18	5.15
Africa	2.29	2.24	2.23	2.36	2.60	2.96	3.06	3.11	3.48	3.13	3.41	3.33	3.46	3.17	2.92	2.37	2.17
Asia	32.03	30.08	31.25	31.89	32.95	34.18	34.93	35.16	35.88	36.75	38.91	39.31	40.39	40.33	40.70	41.29	40.76

Fig. 6.1 Goods: Annual trade and share; 2000–2016 in percentage of the total world export. (*Source:* **Authors'** calculations, based on data from UNCTADStat, http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx)



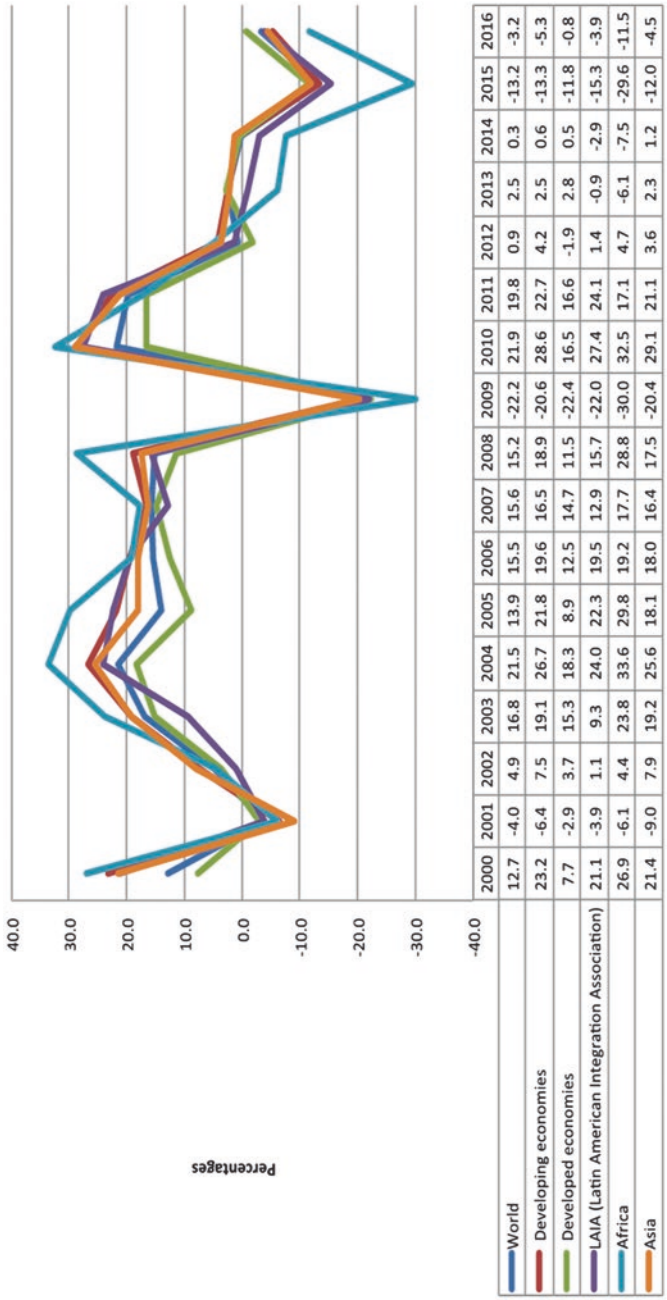
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	12828	14762	17219	19738	15802	18828	22361	22658	23357	23778	21064	20641
Developed economies	8075	9080	10515	11693	9400	10700	12376	12199	12603	12983	11675	11677
LAIA	607	720	819	952	755	948	1166	1188	1184	1154	995	961
Africa	381	445	532	664	485	612	694	730	705	651	490	457
Asia	4071	4792	5625	6619	5369	6858	8294	8670	8914	9116	8150	7878

Fig. 6.2 Global trends in goods and services by region, 2002–2016 (USD current billions). (*Source:* **Authors'** calculations, based on data from UNCTADStat, http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx)



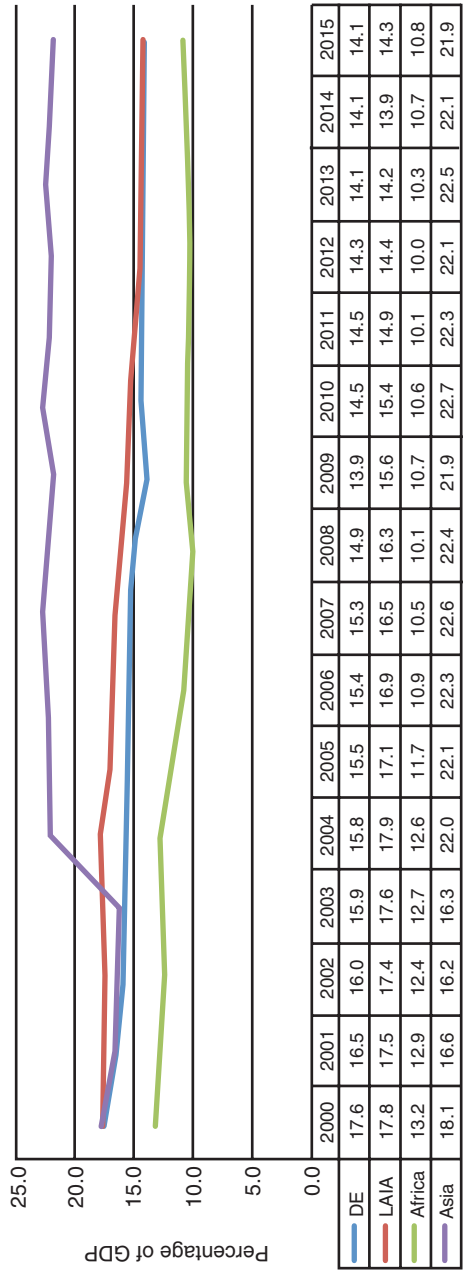
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	10173.7	11766.7	13640.3	15720.6	12213.5	14902.1	17950.2	18129.5	18538.4	18627.6	16203.1	15762.9
Developed economies	6087.2	6862.6	7888.3	8783.6	6802.4	7968.6	9323.4	9115.4	9309.0	9451.4	8374.2	8341.1
LAIA	541.8	647.8	732.6	851.1	663.9	844.6	1046.5	1062.8	1052.9	1021.4	867.8	835.0
Africa	319.2	375.2	449.8	571.0	399.6	517.2	595.2	625.3	604.1	545.5	388.7	361.2
Asia	3491.0	4119.6	4807.4	5670.1	4522.2	5822.3	7120.9	7430.1	7609.0	7685.1	6751.9	6477.7

Fig. 6.3 Global trends in goods, 2005–2016 (USD current prices billions – export)



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	12.7	-4.0	4.9	16.8	21.5	13.9	15.5	15.6	15.2	-22.2	21.9	19.8	0.9	2.5	0.3	-13.2	-3.2
Developing economies	23.2	-6.4	7.5	19.1	26.7	21.8	19.6	16.5	18.9	-20.6	28.6	22.7	4.2	2.5	0.6	-13.3	-5.3
Developed economies	7.7	-2.9	3.7	15.3	18.3	8.9	12.5	14.7	11.5	-22.4	16.5	16.6	-1.9	2.8	0.5	-11.8	-0.8
LAIA (Latin American Integration Association)	21.1	-3.9	1.1	9.3	24.0	22.3	19.5	12.9	15.7	-22.0	27.4	24.1	1.4	-0.9	-2.9	-15.3	-3.9
Africa	26.9	-6.1	4.4	23.8	33.6	29.8	19.2	17.7	28.8	-30.0	32.5	17.1	4.7	-6.1	-7.5	-29.6	-11.5
Asia	21.4	-9.0	7.9	19.2	25.6	18.1	18.0	16.4	17.5	-20.4	29.1	21.1	3.6	2.3	1.2	-12.0	-4.5

Fig. 6.4 Average annual growth rate, world exports of goods by regions, % GDP (2005–2016)



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
DE	17.6	16.5	16.0	15.9	15.8	15.5	15.4	15.3	14.9	13.9	14.5	14.5	14.3	14.1	14.1	14.1
LAIA	17.8	17.5	17.4	17.6	17.9	17.1	16.9	16.5	16.3	15.6	15.4	14.9	14.4	14.2	13.9	14.3
Africa	13.2	12.9	12.4	12.7	12.6	11.7	10.9	10.5	10.1	10.7	10.6	10.1	10.0	10.3	10.7	10.8
Asia	18.1	16.6	16.2	16.3	22.0	22.1	22.3	22.6	22.4	21.9	22.7	22.3	22.1	22.5	22.1	21.9

Fig. 6.5 Manufacturing value-added as a share of GDP. (*Source:* **Authors'** calculations based on data from UNCTADStat, http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx)

However, this does not necessarily indicate that a sustained process of industrialisation is underway, as this increase was from a low base (UNCTAD 2016). Africa's share of global manufactures was only 1% in 2000–2016, whiles Asia's increased significantly to 43% and Latin America's increased marginally to 4% over the same period (Figs. 6.6 and 6.7). The share of manufacturing in total value-added as a share of GDP

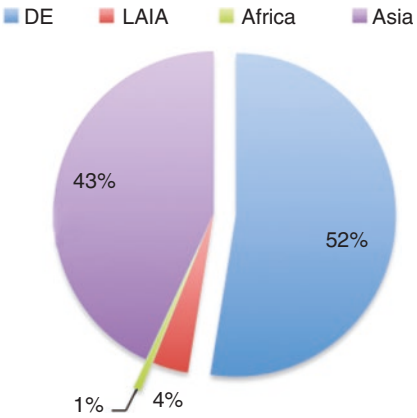
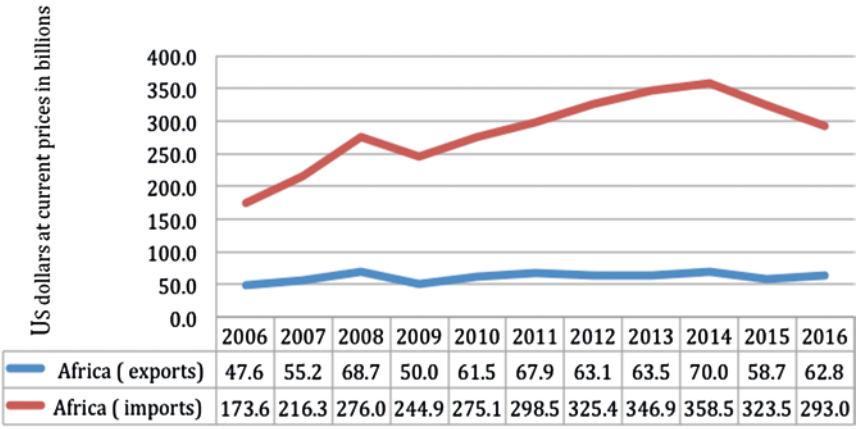
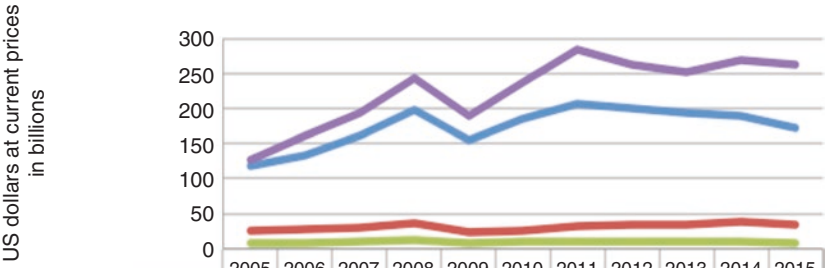


Fig. 6.6 Export of manufactured goods by degree of manufacturing (2016)



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Africa (exports)	47.6	55.2	68.7	50.0	61.5	67.9	63.1	63.5	70.0	58.7	62.8
Africa (imports)	173.6	216.3	276.0	244.9	275.1	298.5	325.4	346.9	358.5	323.5	293.0

Fig. 6.7 Evolution of African trade in manufactured goods (2006–2015). (*Source:* **Authors'** calculations, based on data from UNCTADStat, http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx)



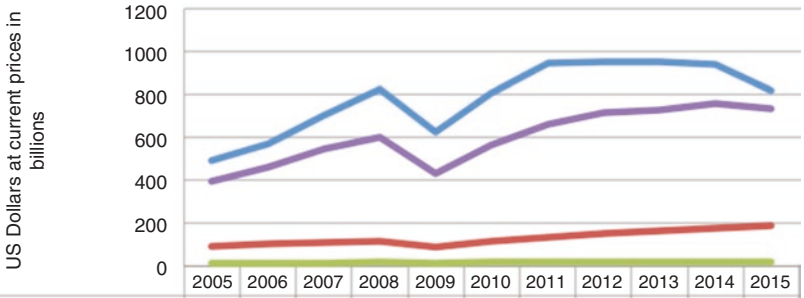
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Developed economies	118	133	162	199	155	185	206	201	193	189	172
LAIA	26	27	31	35	23	26	33	34	34	37	35
Africa	8	9	10	13	8	11	11	9	9	10	7
Asia	126	162	193	244	189	238	284	263	253	271	262

Fig. 6.8 Export of low skills and technology intense manufactures (2005–2015)

declined from 13% (2000) to 11% (2015), with the share of manufactures in total exports declining from 21% to 15% over the same period.[5]

The larger exporters of manufactures had, on average, lower labour productivity growth (UNCTAD 2016). More than 80% of employment in Africa is created in the low-productivity sectors of agriculture and informal services. The continent performs badly in exports of skills and technology intensive manufactures (Figs. 6.8 and 6.9). The share of intermediate goods in total exports increased marginally from 12% to 14% (2015–2016), although this is likely to be due to the decline in the export prices of fuels and other raw materials rather than an increase in volumes traded (Figs. 6.10 and 6.11). It would thus seem that the de-industrialisation trend that commenced in SSA in the late 1970s, and was aggravated through the structural adjustment period (1980–1990s) has yet to be reversed.

Regarding agricultural products, Africa has been losing market share to emerging and more efficient producers in other developing regions, for example coffee growers in Vietnam. On average, while productivity levels for almost all Africa's agricultural exports have been increasing over the years, these remain low and below those of other developing regions.[6] The continent has also found it difficult meeting the exigencies of modern international trade, including sanitary, phytosanitary and other food



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Developed economies	492	573	701	828	623	809	946	955	955	941	822
LAIA	93	107	110	116	89	118	136	151	162	180	187
Africa	11	13	15	19	13	17	20	19	20	22	20
Asia	393	462	545	603	429	566	662	713	726	756	734

Fig. 6.9 Export of medium skills and technology intense manufactures (2005–2015). (*Source:* **Authors'** calculations, based on data from UNCTADStat, http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx)

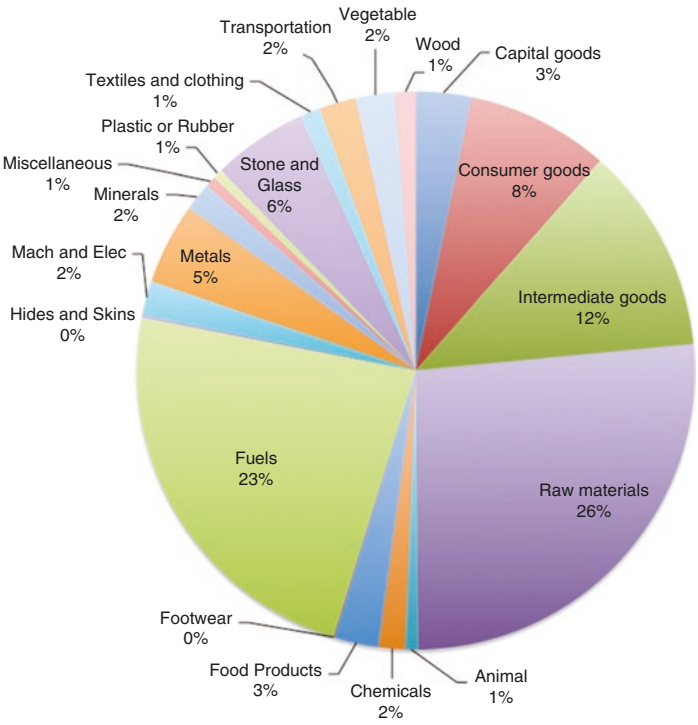


Fig. 6.10 Sub-Saharan Africa export products share, percentage of all products (2006)

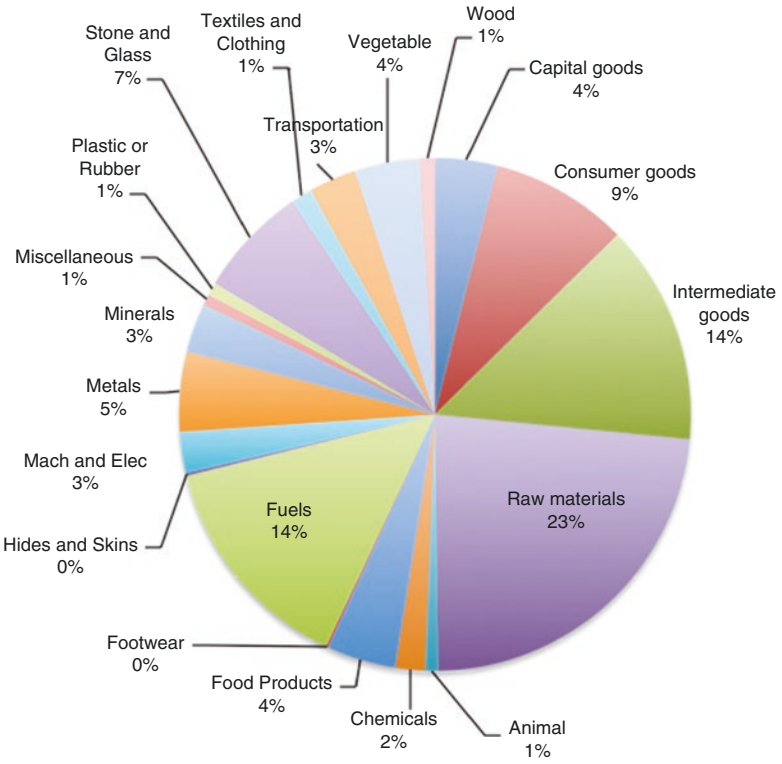


Fig. 6.11 Sub-Saharan Africa export product share, percentage of all products (2015). (*Source:* **Authors'** calculations, based on data from UNCTADStat, http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx)

safety and health standards, as well as traceability requirements. As a result, it has lost its competitive advantage in producing its traditional products such as cocoa and coffee vis-à-vis not only the new but also old, and more competitive producers in Asia and Latin America. At the same time, with a few exceptions—such as Kenya, Ethiopia, and Mozambique—Africa has been unable to break into trade in new and market-dynamic products such as horticultural products (fruits, vegetables and flowers), and fish and seafood, which have high income elasticity and, until the turn of the century, lower rates of protection in industrial and large developing countries.

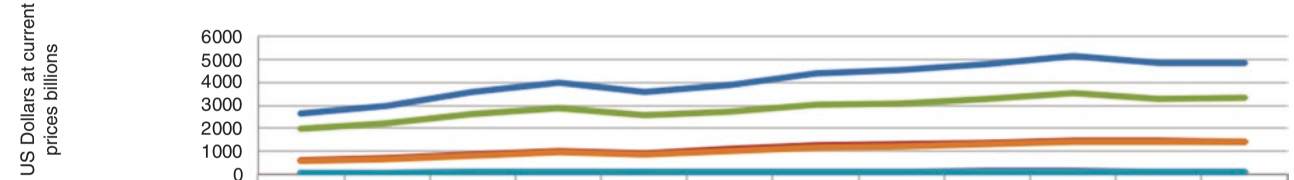
The services sector is significant in world trade, with trade in services (as a percentage of GDP) increasing from 10.9% (USD 2.7 trillion) to 12.3% (USD 4.9 trillion) over the decade 2005–2016. In Africa, however,

the transformation of this sector has been slow, as it has remained subsistent, dominated by low productivity and non-tradable activities. The sector has only picked up in recent years with a few countries supplying cross-border services, such as finance, banking, education, health, commercial and cargo air transport and telecommunications. Increases in exports of telecoms services topped the list with 3.6% (2005) as a share of total services exports increasing to an average of 6% (2013–2016), followed by transport services increasing from 24.9% to 28%, and financial services increasing from 1.9% to 2% over the same period. Despite the vibrancy of the market and the sector's growth at more than twice the global rate in 2009–2011, the continent has remained a marginal player in the global services trade (the fulcrum of global trade in the last decade) with an export share of only 2.0%, compared to developing countries' share of 29.4% in the last decade (see Figs. 6.12 and 6.13).

The region's trade performance, despite recent improvements, compares poorly with those of other developing regions in terms of the diversification of exports baskets, in particular the exports of skill and technology intensive manufactures, and participation in services trade. The reason for this is that the continent has been unable to undergo the type of structural transformation associated with its counterparts in South-East Asia. Primarily this is due to Africa's weak macroeconomic policy environment, low rates of investment and concentration of foreign direct investment (FDI) in the natural resource sector, political instability, poor trade and trade-related infrastructure, and weak institutions, including the legal regulatory frameworks. Low intra-African trade, relative to other developing regions, has also not helped to boost the continent's participation in global trade and GVCs. The next section takes up the issue of structural transformation.

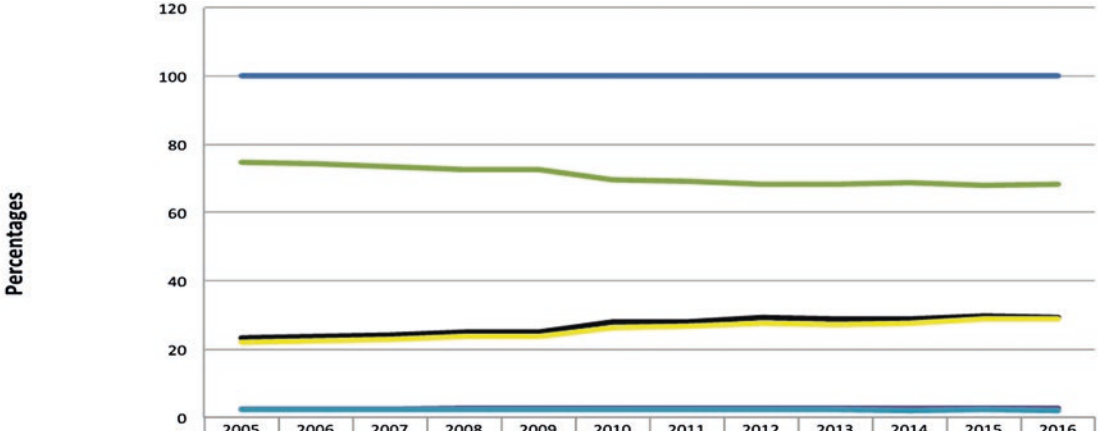
6.4 Structural Transformation Has Eluded Africa

Structural transformation encompasses a reallocation of activities across the three broad economic sectors of agriculture, manufacturing, and services. It entails a shift from low productivity (agricuture) to higher and more labour intensity activities (manufacturing and services). The process is uderscored



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	2655	2995	3579	4017	3589	3919	4406	4530	4820	5154	4862	4879
Developing economies	613	712	869	1003	903	1097	1242	1320	1388	1492	1452	1436
Developed economies	1988	2218	2626	2909	2597	2724	3048	3085	3296	3535	3303	3337
LAIA	65	73	87	101	91	104	119	126	131	132	127	126
Africa	62	70	82	93	86	95	98	104	101	106	101	96
Asia	580	672	818	949	847	1036	1173	1239	1305	1431	1398	1401

Fig. 6.12 Global trends in services, 2005–2016 (USD billions current prices—export)



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	100	100	100	100	100	100	100	100	100	100	100	100
Developing economies	23.1	23.8	24.3	25.0	25.2	28.0	28.2	29.1	28.8	28.9	29.9	29.4
Developed economies	74.9	74.1	73.4	72.4	72.4	69.5	69.2	68.1	68.4	68.6	67.9	68.4
LAIA (Latin American Integration Association)	2.4	2.4	2.4	2.5	2.5	2.6	2.7	2.8	2.7	2.6	2.6	2.6
Africa	2.3	2.3	2.3	2.3	2.4	2.4	2.2	2.3	2.1	2.1	2.1	2.0
Asia	21.9	22.4	22.8	23.6	23.6	26.4	26.6	27.4	27.1	27.8	28.8	28.7

Fig. 6.13 Export of total service, percentage of the world total, 2005–2016. (*Source:* **Authors'** calculations, based on data from UNCTADStat, http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx)

by labour absorption and productivity improvements in the modern sector and institutional improvements, all of which engender a higher and more diversified output. Several economists have long argued that this type of transformation is a sine qua non for long-term growth of per capita incomes, as this gives rise to the acceleration of productivity, output and employment growth over time. In this process, those sectors enjoying the highest rates of productivity growth and capacity expansion lead the innovation process and productivity gains. After that, the pattern of specialisation shifts towards sectors benefiting from faster growth of demand (domestic and external), which in turn generates positive impacts on output and employment (Ocampo et al. 2009; Herrendorf et al. 2014). In the case of Africa, UNCTAD has argued that developing the manufacturing sector and greater economic diversification should be an integral part of its structural transformation to enhance developmental gains (UNCTAD 2013b).

From this perspective, there has been limited structural transformation of African economies (with the exception of South Africa and Mauritius, and to a limited extent, Botswana, Kenya and perhaps a few countries in North Africa) from heavy reliance on the primary sector to a reallocation of economic activities across manufacturing and services sectors.[7] As mentioned earlier, the continent's manufactures represent about 1% of global exports in the last two decades. In addition to this, of all developing country regions, Africa had the highest commodity dependency ratio of 80–100% in 2012–2013.[8] The continent's commodity dependence increased by 7% between 2009–2010 and 2012–2013. Export concentration (based on the Herfindahl–Hirschmann index) increased by 1.2% over the same period, although the number countries for which three leading commodity exports contributed more than 60% of total commodity export revenues remained stable. In 2013, East and Southern African regions had the lowest export concentration ratio (about 0.2, on scale of 0 to 1), with a moderate concentration in North Africa (0.4), and the highest ratios in West Africa and central Africa of between 0.6 and 0.9 respectively (UNCTAD 2014c).

Simply put, Africa has been unable to escape the "(primary) commodity trap", the features of which are vulnerability to external shocks, (e.g., price volatility), the Dutch disease, rent-seeking behaviour due to resource rents, all of which discourage investment and diversification into new economic activities (Collier 2006; UNCTAD 2013c). Thus, the continent's trade performance is not at all surprising as the health of the commodities

sector in resource-rich developing countries affects their overall trade, economic performance and development.

The next section discusses factors that contribute to the lack of structural transformation in Africa.

6.4.1 Macroeconomic Policy Environment

A weak and unstable *macroeconomic environment* in several countries characterised by large fiscal deficits, high inflation and overvalued exchange rates during the late 1970s and 1980s was not conducive to the competitive development of the export sector.

During the 1990s, fiscal deficits averaged 3.5% (1990–2000), experiencing only a marginal deterioration due to the softening of commodity prices from 6.3% of GDP (2015) to 6.6% (2016) for the continent; 7.5% to 8.0% for oil exporters; and 4.4% to 4.5% for oil importing countries. North Africa recorded the highest deficit of 13.5%, while West Africa recorded the lowest deficit at 2.9% in 2016.[9] Inflation in SSA remained very high through the mid-1970s, at about 16.4%, that is 10% above the averages of industrial countries and Asia. A handful of countries also recorded triple-digit inflation (Chhibber 1991).[10] Inflation has, on average, been reduced to single digits in recent years, stabilising at an average of 8% over the period 2000–2017, with only a handful of countries still experiencing double-digit inflation. Floating exchange rates have been adopted by several countries in recent years, but real exchange rate appreciation has yet to be contained. In 2000–2011, this harmed the export competitiveness of more than two-thirds of countries in Africa.[11]

The prevalence of macroeconomic instability during much of the 1980s and 1990s, combined with a fledgling private sector, could not support investments and the diversification of the export sector. And, several countries have yet to design and implement policies or programmes that take advantage of the improving macroeconomic environment since the turn of the century.

6.4.2 Political Stability

Up to about the early 1990s, the forceful overthrow of democratic regimes in several countries, and civil strife—which sometimes deteriorated into

civil wars—in others, created an *unstable political environment*, not conducive to attracting long-term investments. There is little consensus on the "state of political governance" on the continent now,[12] but it is no exaggeration to say that on average this has improved, although challenges remain.[13]

Overall, the political space is becoming more and more liberalised with an increasing number of countries now organising democratic and multiparty elections, even if the outcomes are sometimes contested. As observed in United Nations Economic Commission for Africa (UNECA) governance reports, adherence to constitutionalism has increased and these elections have become acceptable as means of alternating power between competing contenders. In a sense, therefore, the political system has become more inclusive and diverse and the electoral process and institutions are becoming more transparent and credible. Thus, the constraining effect of this variable on investments should be on the wane, if progress continues.

6.4.3 Infrastructure

Lack of, or weak, *infrastructure* is one of the most significant constraints to economic development in many developing countries, and nowhere is this more apparent than in Africa. Weak or poor infrastructure creates inefficiencies and leads to a high cost of doing business as it increases not only production costs, but also international transport costs. Although international transport costs, as a proportion of the value of imports, have been falling over the period 1985–2014, they are highest for developing Africa. During 2005–2014, for example, they were 11.4% in Africa, compared with 9.0% and 8.0% respectively for developing Asia and America, and 6.8% for developed countries (UNCTAD 2015b).[14] Another study suggests that import and export costs are highest in Africa, representing 11% of the value of imports, compared with 7% in Latin America and the Caribbean and 8% in Asia (UNCTAD 1999). On average, developing countries in Africa (and Oceania) pay 40 to 70% more for international transport of their imports than developed countries, the major reasons being regional trade imbalances, lower trade volumes and poor shipping connectivity (UNCTAD 2015b).

Overall, transport costs are much higher for landlocked countries, and for landlocked African countries they are as high as 19% of import value

(UNCTAD 1999). Thus, it does not help that out of the 54 African countries 15 are landlocked, the highest proportion of landlocked countries among the developing regions.[15] These 15 countries suffer a double disadvantage, as they are forced to contend with not only their own customs and border procedures, which are often inefficient, but also with those of their neighbours and transit countries.[16]

The lack of availability and reliability of complementary infrastructure, electricity and, until recently, telecommunications, further compounds the problem, leading to a situation described by *The Economist* (September, 2014) as "bring-your-own-infrastructure" for potential investors. While microeconomic evidence on the impact of domestic infrastructure on firm investment is lacking, Bigsten and Soderbom (2005) suggest that poor infrastructure is the third leading barrier to investment in Africa after financing and corruption. Indeed, it has been argued that half of Africa's improved growth performance between 1990 and 2005 could be attributed to infrastructure investments, and that the returns to infrastructure investment are significant. ICT investments are believed to have returns of 30–40%; power/electricity generation, over 40%; and about 80% for roads (Kingombe 2011).

6.4.4 Institutional Framework

With the exception of a handful of African countries, the continent has weak institutions and legal regulatory frameworks. The World Bank's annual *Doing Business* reports have demonstrated that there is a strong correlation between transparent and less bureaucratic administrative, legal and judicial procedures, and the positive opinion investors have about potential opportunities in a country. A difficult business environment therefore has a negative impact on investment flows. In 2005, the correlation between a country's rank in terms of ease of doing business and the rate of fixed capital formation was found to be statistically significant at −0.33 (UNCTAD 2007). Transparency of the business environment, including secure proper rights, improves not only its quality but also cuts down the costs of doing business significantly. Recent World Bank data (2017) suggest that the time for export border

compliance in SSA is 108.2 hours, which is seven times more than in OECD high income countries and 3.7 times more than in emerging economies.

Well-functioning institutions are critical to the growth process because of the belief that they will boost investments in capital goods and human capital. The magnitude of the impact of institutions on economic performance is likely to be substantial, as suggested by recent estimates. For instance, an improvement in the institutional development of SSA from its current form to the mean of Asian developing countries could boost per capita incomes by as much as 80% (Johnson et al. 2007).

6.4.5 Investment[17]

Low saving rates cannot meet domestic investment needs, such as those required for expanding productive capacity. At the same time, given the unattractive investment climate, it is difficult to attract FDI to sectors beyond the extractives.

Average savings rates increased steadily from about 17.5% of GDP to about 24% (1960–1974) but finally collapsed to below 15% in 1992 (UNCTAD 2007) and have generally remained below those of other developing regions. In 2005, for example, the gross domestic savings in SSA, at 17.6%, was below those of Latin America (24%), South Asia (26%) and about 43% in East Asia and Pacific countries.[18]

Africa's average *investment rate* of 19% of GDP was lower than those of other developing countries (26%) in the two decades to 2011 (UNCTAD 2014b). In contrast, the efficiency or productivity of Africa's investment, was much higher than in other developing country regions of Latin America and Asia in 2000–2011.[19] However, combined with a low efficiency of public investment in SSA, it has been difficult to attract private investment, as returns to such investment have been sub-optimal (UNCTAD 2014b).

FDI flows to Africa by volume are low relative to flows to other developing regions, and in terms of share of global flows and flows to developing countries.[20] Until recently, its share of global FDI flows has been in

decline. From a peak of 6% in the mid-1970s, Africa's share of global FDI flows declined to 2–3% in the early 2000s. Similarly, its share of developing-country flows fell from 28% to 9% over the same period.[21] FDI destinations display a bias towards countries with large natural resource endowments. With few exceptions, oil- and mineral-rich countries, on average, accounted for about three-quarters of FDI flows in the two decades to 2003. Africa's colonial history has impacted its sources of FDI, with the region depending on just three countries for sourcing FDI. France and the UK, the two leading former colonial powers, and the USA accounted for close to 70% of the continent's total FDI, with the first two accounting for a little over 50% of FDI up to 1995.

FDI flows to the continent have increased in the past 15 years by roughly six times to about USD 74 billion (2015), but the absolute levels are still low relative to other developing regions. The share of total FDI going to resource-seeking operations has declined somewhat, with increasing flows heading to the manufacturing, consumer goods and services sectors. Home countries have witnessed some diversity, even if limited, as China and India have made inroads. Nonetheless, the lion's share still goes to the natural resources sector, and the former European colonial powers are still dominant as home countries.

Increases in intra-African investment flows in the last decade, have led some scholars to observe that they are becoming a significant source of FDI for the continent (Balchin et al. 2016).[22] Intra-African FDI, however, also displays a predisposition towards one sector, services. In the period 2003–2011, of the 673 deals relating to intra-African greenfield investments examined, about two-thirds (68.4%) were in the services sector, about one-quarter (27.9%) in manufacturing, and the rest (3.7%) in the primary sector.

In the services sector, 69.9% of all intra-African FDI went to the finance sub-sector (UNCTAD 2013b). While this is encouraging, as access to services such as finance and transport are crucial to the competitiveness of enterprises, the relatively small share going to manufacturing does not appear to make up for its "neglect" in extra-territorial FDI flows. South Africa (and to some extent, Nigeria for financial services) is the main source of intra-African FDI as it is the only African country among the top 20 investors in Africa.

Long-term investment finance continues to be a challenge for the continent. Net capital inflows remained relatively high in the first quarter of 2016, but these are volatile. And while the share of profits in national income has increased since the mid-1990s, it did not always translate into higher investment rates (UNCTAD 2016).

These constraints have also negatively impacted intra-regional trade, which, arguably, should be the launch pad for participation in GVCs.

6.5 Intra-Africa Trade

Despite the long history of regional economic co-operation, *intra-African trade* at about 11%, is low compared to other developing regions, such as Asia (50%), Latin America and Caribbean (21%)—it is 70% in Europe.[23]

A thriving informal trade suggests that official statistics under-estimate the actual level of trade among African countries (UNCTAD 2013c). However, this does not negate the fact that African intra-regional trade is less than its potential, considering the unexploited opportunities in product categories such as fuel. Intra-African trade in manufactured products—labour intensive and resource-based—and low-skill and technology intensive manufactures is relatively high. Non-fuel exporters account for much of the trade in manufactures as their share is higher than that for fuel exporters, which suggests that a more diversified production base could provide an impetus for enhanced intra-regional trade (UNCTAD 2013c). Indeed, there is some evidence that manufactured exports could be much higher with a more developed productive capacity and trade facilitation measures in a context of a proactive regional integration framework. Potential intra-regional trade in leather and leather products, for example, could have been ten times higher in the period 2003–2011 (Banga et al. 2015).

African regional economic co-operation has not been effective in stimulating greater intra-regional trade for a variety of reasons.[24] Low intra-industry trade (arguably, due to weak production and undiversified economic structures) and weak inter-sectoral and inter-country linkages because of poor transport links, have inhibited intra-African trade.[25] Similarly, they have frustrated the development of trade in intermediate

products, which could then evolve into RVCs, thereby facilitating participation and upgrading in GVCs.

Regional economic communities (RECs) have been largely policy or government driven, to the exclusion of the private sector, with markets being "engineered" without the necessary economic or market infrastructure and/or interlinkages within the production structures of countries.[26] They have overlapping memberships and, often, conflicting agendas for trade liberalisation, both of which have frustrated the elimination of intra-regional trade barriers and complicated the definition of the rules of origin for goods traded within the RECs. In addition, the uneven distributional impact of intra-regional trade liberalisation, including lower tariffs, weaken the commitment of governments because of their high dependence on tariff revenues and the apparent lack of alternative tax handles to replace such revenues.[27] RECs have thus performed below their trade and development potential in Africa, unlike in Asia where the participation of emerging economies in vertically integrated regional manufacturing production networks led to increased intra-manufacturing trade across countries and a rise in intra-regional trade (UNCTAD 2013b).

Africa improved its trade performance at the turn of the century, but its share of global trade and trade in GVCs has remained miniscule. A major factor, as discussed above, is its lack of structural transformation underscored by commodity dependence and weak competitiveness. The peculiar characteristics of FDI inflows to Africa have implications for the type of profit-investment nexus generated: enclavism, which denies the wider economy of skills, jobs, technology and growth spillovers; and a preponderance of greenfield investments over mergers and acquisitions. These types of FDI also create an unstable investment climate because of the greater volatility of natural-resource-linked FDI relative to manufacturing sector FDI. These inflows are, arguably, not conducive to entry into, or upgrading in GVCs. Low intra-regional trade marked by weak intra-industry trade suggests that Africa has yet to fulfil its trade potential both on regional and global levels. Increasing intra-African FDI flows should help fill this lacuna. They also display a bias for the services sector, but services are critical to enhanced GVC participation in the future.

What should be Africa's response to these challenges militating against its increased participation in GVCs via RVCs? This is the issue addressed by the next section.

6.6 What Should be Africa's Response to GVCs?

Until about a decade ago, the continent was locked into low growth sectors in which it could not compete, and into trade with countries (mostly Europe) that have lost growth momentum to (East) Asian economies (China, and more recently India), which have become new growth poles for the global economy. Given Africa's weak productive capacities and manufacturing sector it could not take advantage of the opportunities of outsourcing associated with the production of intermediate goods (and services) in GVCs. Nor could it utilise effectively the trade preferences, such as Europe's Everything but Arms (EBA) scheme and the USA's African Growth and Opportunities Act (AGOA) programmes, available in its traditional markets. These mutually reinforcing factors consigned Africa to the lower end of the value chain, supplying raw materials (agricultural products, fuels, ores and metals) to which little or no value is added.

There has been some geographical diversification of trade in the last two decades. China's merchandise trade with Africa increased by more than tenfold from USD 8 billion to USD 93 billion (2000–2008), while India's increased from USD 7.3 billion to USD 31 billion over the same period (UNCTAD 2010). By 2011, China's trade with Africa had climbed to USD 166 billion and about 12.5% of Africa's exports went to China and 4% to India, accounting for 5% and 8% respectively of the two countries imports. In recent years, Indonesia, Malaysia, Saudi Arabia, Thailand and the United Arab Emirates have also become increasingly important markets for Africa's exports (UNECA 2012). These new trade partners have, more or less, replicated the old trading patterns in raw materials, in particular because of China's insatiable appetite for raw materials. And, Europe is still the continent's top export destination.

The emergence of GVCs has exposed Africa's lack of competitiveness,[28] as demonstrated by its weak bureaucracy and dearth of institutional and physical infrastructure. It also lacks the ability to meet the exacting standards (tight delivery schedules, sanitary and phytosanitary, food safety and health) that participation in value chains entails. Low and stagnating shares in global trade and value-added trade suggest that *forward* integration, which responds to the supply side of GVCs for unprocessed products, is no longer a viable option for sustainable growth and development. Just as the opportunities for "trading down" are becoming threatened by ICT-based automation and rapid advances in science as well as in artificial intelligence (AI).[29]

A major policy response for the continent would be to change the composition of exports to its old destinations from low value raw material exports to high value, improved skill and technological content exports, and at the same time seek new markets for these. This would entail becoming active participants in GVCs, through *backward* integration, and moving into higher levels of the value chain. Given the wide-ranging structural constraints to its trade performance, the role of policy in impacting on value chain participation is limited, as revealed by recent empirical analysis (Conde et al. 2015). The main issue then becomes one of designing and implementing broad policies that assure a high level of economic growth and a broad level of development. This goes beyond specific policy measures to upgrade into GVCs to development policies that improve the overall efficiency and competitiveness of the economy. This is a developmental issue, first and foremost; and second, sectoral, implementing specific policies and institutional re-engineering directed at fostering enhanced participation in GVCs and assuring increased shares of value-added.

Considering the competitive disadvantage that much of Africa suffers relative to other developing regions in both the primary and secondary sectors, a major plank of policy reform should revolve round getting RECs to work to improve intra-regional trade as a basis for RVCs in the short to medium term, and GVCs in the long term. "*Acting* regionally while *thinking* globally" is important because, in the final analysis, the continent has to aim for global competitiveness if it is to move up in GVCs. This would entail specific efforts to implement existing protocols on regional integration and economic co-operation, and designing new

ones that specifically address the functioning of RVCs. RVCs by themselves would, however, not be a panacea. The role of the state will be critical in addressing the trade and trade-related constraints faced, in particular, by the least developed countries (LDCs) in the region. In some of the middle-income countries, however, governments could partner with the private sector through public–private partnerships (PPPs) to engender the conditions necessary for improving the efficiency of trade and competitiveness. PPPs may be necessary in some sectors in LDCs as well.

6.6.1 Why Act Regionally but Think Globally?

There is scope for intra-regional trade to support industrialisation and diversification as current regional exports are more diversified and dominated by manufactures and processed products. Africa's share of this group of products has been higher than its share in extra-regional trade since 1996 (UNCTAD 2013b). Despite this share subsequently falling, an enabling environment for competitive productive, regional trade could serve as a launch pad for African manufactures to the rest of the world. There is also scope for increasing trade in energy products, which are now the least commodities despite their dominance in extra-regional exports trade and in the imports of non-fuel producing countries. RVCs could thus provide opportunities to link gainfully into GVCs by moving up the value chain from primary input production to processed and manufactured products. In addition, intra-regional trade could increase the potential for formal trading of food products, much of which currently feature in informal cross-border trade. This would not only increase revenues, but also reduce instances of food insecurity and/or provide greater opportunities for addressing that problem.

Mature RVCs could provide an alternative way of improving competitiveness and integrating *backwards* into GVCs through branding, marketing and logistics. By so doing, they could improve bargaining power with lead firms and provide access to export markets, technology and FDI. This is demonstrated by the flying geese theory of East Asia whereby fragmentation of production networks improved cost competitiveness,

with final products being able to compete with those from developed countries.[30]

Enhanced intra-regional trade via RECs provides the opportunity for economies of scale for the functioning of RVCs, and a basis for the development of viable RVCs. In particular, RECs will automatically raise the demand for inputs into various products and permit economies of scale in the production of manufactures to supply regional markets. Well functioning RVCs will expand market size since individual African markets are too fragmented to provide the required conditions for international competition. Only three African countries, Mauritius, Morocco, Rwanda and South Africa, were considered competitive according to the global competitiveness index (2012–2013).

In the rest of this section, a three-pronged approach is presented. The first addresses economy-wide or structural weaknesses that would enable the economy to perform at, or close to, its optimum level. As far as possible, policy reforms should be co-ordinated across regional economies with a view to increasing intra-regional trade through RVCs. The ongoing discussions of the UNECA and the African Union towards launching a continental free trade area (CFTA) have the objective of creating the conditions necessary for increasing intra-African trade using RECs as building blocks.

Secondly, considering the high commodity dependence in the region, there is the need for a holistic approach to commodities development in each country, which should be co-ordinated within a regional framework. Inevitably, one aspect of this will focus on agricultural products with a view to promoting forward and backward linkages between the natural resource sector and industry at national and regional levels. This should serve as a spring board to identifying the best and most competitive positioning in each commodity GVC in terms of tasks or functions in the medium term. A second aspect of a regional commodities development programme will be to design a strategy for minerals, metals and fuel commodities exports based on establishing development linkages with national and regional economies.

Thirdly, there should be a framework for developing a services sector with a view to transforming it from providing low-value, informal ser-

vices to high-value, formal services that respond to the needs of public enterprises and private ones in the formal sector.

6.6.2 Economy-Wide Weaknesses

The advantages of intra-regional trade via RECs notwithstanding, the more fundamental problems of structural constraints to expanding the production of tradables would need to be addressed head on. These are unlikely to be solved by regional integration, nor would they be resolved in the short term. Domestic policies of African countries directed at solving these supply-side constraints (for example, poor infrastructure, skill shortages, and low levels of R&D) in the long term therefore become important if they are to reap the full benefits of regional economic integration, such as developing RVCs and moving up into the higher echelons of GVCs.

Macroeconomic management has improved a great deal in the aftermath of the structural adjustment programmes of the 1980s and 1990s. Inflation has been reduced to single digits in many countries. The adoption of a floating exchange rate policy in several countries has ensured that overvaluation of local currencies is limited. And, governments are now sensitive to the running of high fiscal deficits, although the collapse in a range of commodities prices since 2013 has exposed some vulnerabilities in this area. Several countries, notably Angola, Nigeria and Ghana, have had to seek IMF funding to sustain planned expenditures. This suggests that some improvements are required to maintain progress achieved in macroeconomic stabilisation. Firstly, countries have to ensure that windfall incomes from commodities do not give rise to increased expenditures that become unsustainable in times of low prices. Secondly, the management of sovereign wealth funds would need to be improved. This has become fashionable for several commodities producers (and for good reason) but there appears to be some management issues. Overall, better economic fundamentals will attract the necessary FDI into sectors capable of producing intermediate goods and services that have the potential to enhance GVC participation.

Other issues should also be the concern of national governments. These include, improving transportation and communications/ICT

infrastructure, human capital development, reducing red tape and bureaucratic hurdles, improving the business and regulatory environment, standards, and supporting research and development (R&D). Ethiopia's export-led strategy based on the provision of land, infrastructure and logistical services is a good illustration. The Millennium Dam project has significantly reduced the cost of electricity in Ethiopia relative to its neighbours and much of Africa. However, considering the costs imposed on neighbours by these constraints—in particular, landlocked countries, as discussed earlier—a regional approach to these would yield positive externalities. For instance, the new fully electrified cross-border rail link between Addis Ababa in Ethiopia and the Red Sea port of Djibouti, the first in Africa, will reduce the journey from three days to 12 hours. While programmes to improve links must necessarily be national they must also consider regional dimensions with a view to promoting intra-regional trade as well as the development of RVCs.

Tariffs would also have to be rationalised in a regional context considering that a critical element entailed in the functioning of R/GVCs is fragmentation of production across borders. Dismantling non-tariff barriers deserve priority as in practice they tend to be more constraining and frustrating of trade in the region. Product standards, discriminatory foreign exchange allocations, quotas, non-automatic licensing, administrative hurdles, unnecessary document requirements and non-harmonisation of such documents, and lengthy delays at border crossings are believed to have a negative effect on intra-African trade.[31]

The urgency and importance of these issues has led to renewed efforts towards actualising the treaties for a CFTA in the region. Well thought out programmes to address specific aspects of enhancing trade and promoting regional trade have languished in archives for a long time. Take the case for improving regional transportation links. The sub-Saharan Africa Transport Policy Program, launched in 1987 is dedicated to ensuring that the transport sector fosters Africa's poverty reduction, and regional integration. This is a unique partnership of SSA countries, RECs, three African institutions and many national and international development partners.[32] Over the past three decades, the programme has evolved somewhat, but it is by no means close to fulfilling its objectives. Africa's transport infrastructure has improved, but financing has proved a big

constraint to the provision and maintenance of new roads, although the potential benefits are enormous. One estimate suggests that paving Africa's key trading roads could cost as much USD 32 billion but generate additional trade worth USD 250 billion over 15 years (Buys et al. 2006). And, according to Gijon (2008), investment in new infrastructure would cost USD 40 billion a year, and another USD 40 billion per annum to maintain existing ones.

6.6.3 Holistic Commodities Strategy

A holistic commodities strategy should be designed with the overarching objective of reducing Africa's high commodity dependence and diversifying productive capacities to support and strengthen industrial transformation.[33] The strategy should cover both the agricultural and the extractive sectors, despite the distinctive characteristic of each sub-sector, in order to ensure that the necessary trade-offs and complementarities are taken into account to ensure optimal outcomes for the commodities sector—for example deciding whether to mine gold or bauxite deposits in a rich agricultural land; or whether fertiliser for agriculture should be produced locally where the local resources or inputs are available.

The agricultural sector, at a broad level, would certainly benefit from polices that: (a) reduce the impact of price volatility on domestic producers, for example, through warehouse receipt systems linked to local exchanges, and risk management strategies (in the case of cash crops, such as cocoa and coffee, this would be in the form of remunerative "producer prices" that shadow international prices); (b) facilitate access to finance and other agricultural inputs; (c) deepen regional commodities markets, consonant with existing RECs as a means of market expansion; (d) maximise and better manage the economic rents associated with commodities production (and exports), through the full use of policy instruments at the firm, sectoral and macroeconomic levels; (e) improve and harmonise safety and health standards through capacity building, and (f) encourage the formation of commercially oriented farmer-based organisations (FBOs), which can be the units of aggregation and support, in terms farmers' needs. There should also be a complementary package of

policies that makes it possible for small-scale producers to transform their operations into businesses.[34]

The specific objectives of the strategy should be to improve the competitiveness of the sector by reducing informality and introducing market institutions; enhance diversification and production to ensure forward and backward linkages in the domestic economy in order to increase value addition; and to create jobs. Policy interventions could target specific areas of development concern, with a focus on encouraging horizontal and vertical linkages and diversifying into new lines of economic activities that promote the local transformation of commodities through value addition.

Agricultural commodity sectors, such as those whose value chains are dominated by trans-national corporations (TNCs), may require policies that respond to their unique circumstances. In the case of cocoa, for example, the policy package would comprise the following: reinforcing competition law and policy at the national (and international) level; enhancing transparency in both local and international markets; creating opportunities for the emergence and development of small players at the domestic level; and promoting product differentiation to enable farmers to benefit from higher prices.[35]

The GVCs of metals, ores and fuels do not easily lend themselves to the type of value addition and gainful upgrading that is common with agricultural commodities. This is because they are dominated by big mining conglomerates or TNCs. It is therefore no surprise that GVC participation is weaker in Africa and Latin America, the developing regions most dominated by natural resources extraction. The strategy of governments for these commodities would therefore have to be slightly different. A "development linkages" strategy, sometimes referred to as "local content development", comes in handy here.

This is a policy that aims to reduce or break the enclavism of TNCs operations in the natural resource sector by establishing economic links between their activities and the domestic economy. The policy thrust would be to develop and promote the local private sector (small and medium scale enterprises (SMEs), for example) to undertake subcontracting work for TNCs in the host country. This would normally entail engaging the private sector to provide "producer services" such as business

and professional services (book-keeping, accounting, catering, hotel/accommodation, etc.), financial, banking and insurance services, and real-estate services (architectural, engineering, electrical, etc.). This should be supported by enhanced domestic R&D capacity engineered through co-operation arrangements between governments and TNCs. In time, this could evolve into the supply of inputs by local entrepreneurs and then into capacities to provide upstreaming services such as innovation and design, thereby increasing captured value at the domestic level.

Once more, it is important to underscore the central role of governments as some of these preconditions are a sine qua non. These include, in addition to the macroeconomic conditions: infrastructure and power issues discussed earlier; developing local capabilities in the form of a vibrant private sector with strong entrepreneurial skills and a skilled workforce; and TNCs willing to co-operate with government to achieve its objectives. Where these conditions are lacking, governments would have to institute programmes that deliver them, such as overhauling the educational, technical and vocational training system (setting up apprenticeship and/or on-the-job training programmes), supported by R&D in a context of a national innovation system.[36] TNCs could be brought on board through formal agreements/contracts, or informal ones based on nudging them towards these goals.[37] The contracts with TNCs could oblige them, inter alia, to undertake joint-ventureships (JVs) with local companies/SMEs, contribute to training funds, transfer technology and, in some cases, use "local content". Namibia established the Petroleum Fund to train personnel for its energy sector, and Qatar established JVs and entrepreneurship development and training programmes with Total to kick-start of its petrochemical industry. Other practical examples of this model are the Industrial Linkage Programme (ILP) in Indonesia and the Vendor Development Programme (VDP) in Malaysia.[38]

The two strands of the commodities development strategy could feed into a fully-fledged "industrial policy" in the medium to long term, with a new emphasis on sectoral strategies. The development linkages strategy, for instance, could thus be a harbinger to transforming the extractive sector into a manufacturing process divided into segments, similar to agricultural commodities, if properly imbedded in this industrial policy.

6.6.4 Services Sector: Moving from Low to High Value Services

Services are critical to sustained economic growth and transformation and, in particular, to the promotion of intra-regional trade and GVCs. They have become even more important than previously thought, as the TiVA database has shown that the services content of exported goods is much higher than revealed by statistics on trade in services (OECD et al. 2013).

Despite the growth of Africa's services sector in the last decade, it is still dominated by informality and low-value services at high cost, hence the need for improving its efficiency. Among other issues, this would entail addressing the structural impediments, including regulatory challenges, and prioritising services in the on-going discussions on the CFTA.[39] "Producer services", intermediate inputs to further production activities sold to other firms, are critical for value chain participation. These include, business and professional services, financial services, insurance services and real-estate services.[40]

Trade finance has most often been selected for attention but the other categories of services are equally as important (see discussion below). Access to formal sector finance should be a priority as it is still an issue for businesses. This has to be tackled in the context of new financial sector reforms that target competition and high costs in the sector, as these persist despite earlier reforms. Insurance services become indispensable to R/GVC participation as more and more firms sub-contract and would want to be protected in case of any default. This should be supported by an efficient legal and regulatory framework that deals with cases in the shortest possible time.

Intra-regional trade is facilitated by the ease of accessing trade information and the development of a range of business and professional services, including ICT, ancillary to trade promotion. These should be complemented with improvements and modernisation of the transportation and communication infrastructure (as discussed above). The WTO Trade Facilitation Agreement could be used to great effect in these areas. Countries should be encouraged to use the Trade Facilitation Agreement Facility to conduct a "needs assessment"—that is, to assess their capacity

to implement, and in the process identify, their technical assistance needs. For example, what type of measures (category A measures) should African countries have implemented within one year of the agreement coming into force? What of category B measures (that is, provisions that the member will implement after a transitional period following the entry into force of the agreement)? And most importantly, what assistance and support for capacity building is required by Africa in support of trade facilitation (category C measures)?

Middle income economies such as South Africa, Mauritius and North African countries, which have more developed manufacturing sectors, may have to pursue slightly different strategies that build on their existing capabilities. Considering their level of development, they may be better placed to adopt sectoral policies, such as clusters, through economic processing zones and FDI policies to encourage backward linkages that enable them to link gainfully and move up in GVCs.[41]

6.7 Concluding Remarks

Africa's participation in global trade and GVCs has remained insignificant as its exports are dominated by unprocessed raw materials (agricultural commodities, and fuels, minerals and ores), which provide inputs to the manufacturing processes of other countries. More than half a century after their independence, most countries remain highly commodity dependent because of a lack of structural transformation. Past efforts to address this have been met with limited success. While the rates of inflation and fiscal deficits have been brought under control, the high dependence on commodities with volatile prices and weak macroeconomic management capacities, means that several economies have yet to attain robust macroeconomic stability. With the exception of a few countries, weak infrastructure, inefficient bureaucracies and weak institutions are pervasive despite some recent improvements. All these problems dictate that efforts to enhance participation and upgrade gainfully in GVCs go beyond sectoral issues to incorporate economy wide (or macro) issues. In this context, gainfully linking into value chains becomes synonymous with the fundamental issue of how to ensure sustainable growth, development, job

creation and poverty reduction. Considering that most of these shortcomings relate to public goods, the role of the state cannot be overemphasised. However, there is an important role for the private sector, especially in middle level income countries and in some of the LDCs, where it could team up with government within the framework of PPPs.

Africa does not have the luxury of not enhancing its participation in GVCs. As goods and services get increasingly produced and traded across national frontiers, the essence of the "rules of origin" is being eroded and may soon become obsolete. This suggests that it is only a matter of time before the preferential trading schemes lose their value for the continent, as it becomes more and more difficult to assign "nationality" to a product with precision or certainty. RVCs could provide a training ground for countries before they venture into the global market. But for this to happen, and for the continent to get more beneficially embedded in GVCs, it would need to initiate the process of structural transformation.

The policy conclusions derived from the discussion so far are more illustrative than exhaustive and revolve round the following issues.

Get Economic Fundamentals Right This entails attaining macroeconomic stability on a sustainable basis, providing basic public goods (infrastructure, roads, energy and water), efficient and transparent bureaucracy, legal and regulatory frameworks, and an efficient financial sector.

Promote Trade Within a Regional Economic Co-operation Framework Develop institutions that promote trade facilitation, including trade and trade-related infrastructure (port improvements, reduce and/or harmonise documentation required for customs and border crossing, and eliminate random road checks), and improve access to trade information, trade finance and insurance services.

Develop a viable private sector that has strong entrepreneurial skills, supported by a revamped educational and skills training programme that provides a pool of well trained personnel for local and international business operations. This should be linked up with R&D and technological development and innovation systems, incorporating local businesses and research institutions and universities.

Africa's participation in global trade and GVCs is lacklustre because of the dominance of natural resource exports in its export basket. FDI is also concentrated in this sector due, inter alia, to the structural weaknesses of these economies, manifested in the prevalence of a weak physical and institutional infrastructure, non-transparent legal and regulatory frameworks and a generally weak business climate. The upshot is that the manufacturing and service sectors that have given impetus to the development of GVCs through the splicing or slicing of tasks have yet to develop their potential. African leaders are aware of the potential of intra-regional trade to develop RVCs through harnessing comparative and competitive advantages.

Several of the policies discussed above have thus been implemented at some point in the past in one or several countries but without the desired outcomes. In some cases, the programmes designed end up languishing on the shelves. A common theme in these two circumstances is the *lack of (serious) implementation.* Thus, it must be underscored that implementation of the programme is critical to attaining the desired outcomes. This should be conceived of as a process of evaluating progress being made and feeding the results of this evaluation into improvements to the programme. This necessitates an active commitment to and support of the programme from the highest political leadership (i.e., heads of state) who must also commit sufficient financial and personnel resources to implementation. In this regard, political stability becomes important, not only in the sense of not removing governments by force, but also considering policy consistency or predictability. Projects with high sunk costs and long gestation periods— the types likely to develop the skills and institutions necessary for developing sustainable value chains—only become attractive in such a context.

Appendix: Explanatory Note on Categories of Services as Described by UNCTAD

Services are classified into the following four main categories: goods-related services (manufacturing services on physical inputs owned by others and maintenance and repairs), transport, travel and other services.

Other services are further disaggregated into: construction, insurance and pension services, financial services, charges for the use of intellectual property, telecommunications, computer and information services, other business services, personal, cultural and recreational services, government goods and services and services not allocated (UNCTAD).

Goods Related Services This covers manufacturing services on physical inputs owned by others, and maintenance and repair services.

Transport This includes all transport services involving the carriage of people and objects from one location to another, as well as related supporting and auxiliary services. Also included are postal and courier services.

Transportation This covers all transportation services that are performed by residents of one economy for those of another and that involve the carriage of passengers, the movement of goods (freight), rentals (charters) of carriers with crew, and related supporting and auxiliary services. Some related items that are excluded from transportation services are freight insurance (included in insurance services); goods procured in ports by non-resident carriers and repairs of transportation equipment (both are treated as goods, not services); repairs of railway facilities, harbours and airfield facilities (included in construction services); and rentals or charters of carriers without crew (included in operational leasing services) (UNCTAD 2017).

Travel This covers primarily the goods and services acquired from an economy by travellers during visits of less than one year to that economy. It includes business and personal travel, which includes health-related expenditure (total expenditure by those travelling for medical reasons), education-related expenditure (i.e., total expenditure by students), and all other personal travel expenditure.

Communications Services This covers postal and courier services (which cover the pick-up, transport and delivery of letters, newspapers, periodi-

cals, brochures, other printed matter, parcels and packages, including post office counter and mailbox rental services) and telecommunications services (which cover the transmission of sound, images or other information by telephone, telex, telegram, radio and television cable and broadcasting, satellite, electronic mail, facsimile services and so on, including business network services, teleconferencing and support services). It does not include the value of the information transported. Also included are cellular telephone services, internet backbone services and on-line access services, including provision of access to the internet.

Construction Services This covers work performed on construction projects and installation by employees of an enterprise in locations outside the territory of an enterprise.

Insurance Services This covers the provision of various types of insurance to non-residents by resident insurance enterprises, and vice versa. These services are estimated or valued by the service charges included in total premiums rather than by the total value of the premiums.

Computer and Information Services This covers hardware and software-related services and data-processing services; news agency services include the provision of news, photographs, and feature articles to the media; and database services and web search portals (search engine services that find internet addresses for clients who input keyword queries).

Wholesale, retail trade, restaurants and hotels: ISIC Rev.3, divisions 50–55.

Agriculture consists of agriculture, hunting, forestry and fishing: (ISIC Rev.3, divisions 01–05).

Industry consists of mining and quarrying, manufacturing, electricity, gas and water supply, and construction (ISIC Rev.3, divisions 10–45).

Services include all other economic activities (ISIC Rev.3, divisions 50–99). Mining, manufacturing and utilities: ISIC Rev.3, divisions 10–41. Construction: ISIC Rev.3, division 45.

Notes

1. See, http://ivanstat.com/gdp/africa.html (accessed 28 August 2017).
2. Upgrading can be defined as improving one position up on the value ladder, that is, moving away from products and services with low value-added and low barriers of entry to more sophisticated and higher value-added products and services (January 2015).
3. In terms of exports and imports of goods and services, foreign trade accounts for more than 50% of the GDP of African countries. However, its relatively poor export performance only confirms how import dependent the continent is for its survival.
4. The discussion focuses on manufacturing, agriculture and services as these are the sectors that are currently important for GVC participation.
5. Note, however, that a recent ODI study contends that African manufacturing has grown by about 3.5% per annum in real terms over the past decade, with a gradual increase in the technology intensity of these exports (Balchin et al. 2016).
6. There have been some phenomenal increases in productivity levels in a few African countries since 2000, but these are still below productivity levels attained in other developing country regions, in particular, Asia.
7. Some authors have argued that there have been some improvements in the fortunes of Africa since the turn of the century (McMillan and Harttgen 2013), but this is varied across countries and regions, with the notable examples of Ethiopia (leather products and garments) and Lesotho (textiles and garments).
8. Commodity dependence is defined as the ratio of (percentage) the value of commodity exports to the value of total merchandise exports. A country is commodity dependent if this ratio exceeds 60% of the country's merchandise export value (UNCTAD 2014c).
9. African Economic Outlook, 2017, accessed 6 June 2010.
10. It is only in Francophone West Africa that inflation has traditionally been low because of the pegged exchange rate to the French Franc.
11. See, Economist Intelligence Unit (EIU), 16 March 2016
12. For example, the Ibrahim index of African governance shows that only six countries (Botswana, Cabo Verde, Mauritius, Namibia, Seychelles and South Africa) of the 54 have made progress between 2011 and 2014 (UNECA 2016).

13. There are still about seven leaders who have been in power for at least the past 25 years, and there have been some attempts to rewrite constitutions to remove term limits for incumbents, some of which have failed. Political conflicts in a handful of countries have become protracted (Somalia, Democratic Republic of Congo and the Central African Republic, for example) and a few countries in the Sahel also face increasing security risks.
14. This excludes insurance costs, as a percentage of the "cost, insurance, freight" value of the imported goods.Comprehensive data is unavailable, but anecdotal evidence suggests that, effectively, freight rates for exports are lower than those for imports in most countries in these two regions (UNCTAD 2015b).
15. These are, Botswana, Burkina Faso, Burundi, Central African Republic, Chad, Ethiopia, Lesotho, Malawi, Mali, Niger, Rwanda, Swaziland, Uganda, Zambia and Zimbabwe.
16. For other estimates of the cost of poor infrastructure to African economies and the challenges of landlocked countries, see Chap. 2, UNCTAD 2009.
17. Note that there is substantial cross-country variation in both savings and investment rates.
18. A few countries such as Algeria, Botswana, Cape Verde, the Congo, Equatorial Guinea, Guinea, Lesotho, Sao Tome and Principe, and Seychelles attained rates of 25% or more.
19. Measured by the Incremental Capital Output Ratio (ICOR).
20. Unless otherwise stated, this section is based on UNCTAD 2005b.
21. Viewed from another perspective, however, this share is consistent with the continent's share in world output as the ratio of Africa's share in global FDI flows to its share in global output has remained broadly unchanged over this period (UNCTAD 2005b).
22. This notwithstanding, intra-African FDI at 5% of total FDI projects value (2003–2010) is low relative to the share of intra-ASEAN (Association of South East Asian Nations) FDI inflows in total FDI flows to ASEAN, which averaged 16.7% (2008–2010).
23. See UNCTAD 2013; and UNECA 2004a, b.
24. See Onitiri 1995, UNCTAD 1996, and UNCTAD 2013a, for a more elaborate discussion of some of these issues.
25. Intra-industry trade averages 10% of total trade for a number of countries, with huge country variations (UNCTAD 2013b, citing Ofa et al.

(2012)). Transaction costs are much higher for intra-African trade than for trade with the rest of the world. The average transport costs in Africa represent 7.7% of total export value, double the global average of 3.7% (UNCTAD 2013b).

26. On the contrary, in Asia where intra-regional trade has been so successful, production interlinkages and intra-trade expansion have evolved in the absence of a formal institutional mechanism for co-operation and integration, almost certainly because of the greater involvement of the private sector.
27. Fiscal-compensation instruments designed to redress disproportionate losses suffered by some REC members are complex and difficult to administer, particularly because of unreliable statistical data in many countries.
28. It must be acknowledeged that a handful of countries have made it to the top 50/100 of the World Economic Forum's competitiveness ranking in the past two decades.
29. *The Economist*, 26 August 2017, for example, reports of advanced efforts to use genetic engineering to grow leather without any need to raise animals. And, there are companies currently experimenting with automation for sewing clothes, without any need for tailors.
30. Starting with the first tier of countries—Japan, South Korea, Taiwan and Hong Kong—production networks later moved into the second tier of countries comprising Indonesia, Thailand, Malaysia and the Philippines.
31. For a detailed discussion on these, see UNCTAD 2013b.
32. The partnership comprises 36 SSA countries, eight RECs, two African institutions (UNECA, AU/NEPAD); ten active donors—the European Commission (main donor), Denmark, France, Ireland, Norway, Sweden, the UK, the Islamic Development Bank, the African Development Bank and the World Bank (host)—and numerous public and private state and regional organisations.
33. Both the African Union and the Secretariat of the African Caribbean and Pacific (ACP) are in the process of designing such regional strategies. For the ACP, see paragraph 26 of the Sipopo Declaration "The future of the ACP Group in a changing world: Challenges and opportunities", 7th Summit of ACP Heads of State and Government, Sipopo, Equatorial Guinea, 13–14 December 2012.
34. For an elaborate discussion on this, and the specific policies entailed, see UNCTAD 2015c.

35. For the details of these policies, see Gayi and Tsowou 2016
36. For the technical details on the innovations systems for local value chain and knowledge, see Lee 2017.
37. The informal approach has been found to work quite well in some countries as it is based on trust between governments and TNCs, and reduces or avoids legalities. However, whichever of these two approaches is adopted will depend on the political, social and economic context of the country.
38. The objective of Indonesia's ILP is to develop domestic SMEs into competitive manufacturers and suppliers of parts and components and related services to TNCs, which benefit from some fiscal incentives such tax incentives for limited periods. Eligible SMEs are granted, among other benefits, an investment tax allowance on qualifying capital expenditure incurred within a specified period. Malaysia's VDP has similar objectives, that is: to stimulate SMEs as reliable manufacturers and suppliers of industrial parts and components required by TNCs and large industries—so called "anchor companies" willing to participate; and create growth through "industrial deepening" and import substitution. Participating SMEs must meet certain conditions, for example, 70% local equity participation, and have skilled workers with relevant experience. For details, see UNCTAD 2005a, b.
39. For a detailed discussion on how to unlock the potential of Africa's services sector to promote trade and development, see UNCTAD 2015a.
40. Based on International Standard Industrial Classification (ISIC) Rev.
41. For a detailed discussion of these policies and how they have been implemented in developing countries in Asia and Latin America, see Banga 2013.

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7

Logistics and Value Chain Development: Cost and Capability Considerations

Jodie Keane

7.1 Introduction

The term global value chain (GVC) has been transformed in recent years and emerged as a new paradigm to understand contemporary patterns of global trade. The more recent additions to the GVC literature focus on vertically fragmented trade—trade in intermediate goods—between tiers of firms and suppliers organised within global production networks. As described by Keane (2014), this literature was prompted by the need to better understand the domestic and foreign content of exports, so as to avoid double counting related to the use of imports. In comparison, the highly asymmetric distribution of

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shares of value added between chain actors was the focus of the 1990s wave of GVC literature (Keane 2012).

In view of the low shares of value added now available at some GVC entry stages, coupled with high trade costs because of geographical distance from the main hubs of global economic activity, attention has begun to shift towards analysis of "future fragmentation" processes (Keane and Bambil-Johnson 2017). It is recognised that the global trend toward supply chain rationalisation poses big challenges to smaller countries and firms, which face substantial scale and purchasing power limitations (Gereffi and Luo 2014). It is increasingly recognised that, underpinned by the fourth industrial revolution, future fragmentation processes will be supported by a very different global trading landscape.

Through comparative analysis of the interactions between trade costs, GVCs and economic development, Zi (2014) finds that "Factory South" (as opposed to "Factory US", "Factory Europe" and "Factory Asia") is likely to be regionally clustered. This finding is based on an analysis of two opposing forces: international cost differences and the benefits of co-location of related stages. This is because of recognised tensions between the comparative costs that create incentives to "unbundle" compared to agglomeration forces that may bind some parts of a process together, for example, through reducing the costs of co-located activities and developing network effects.

However, while much of the current GVC discourse has focused on these aspects of trade costs, directly affected by the logistics sector, much more limited attention has been paid to the role of the logistics sector in terms of the development of producers' capabilities. This is an important omission that assumes a particular importance in view of the role of the logistics sector in relation to conventional value-adding processes: gaining control of the logistics sector can assist in enabling forms of upgrading. The ability to service multiple markets can also assist in enabling a type of "multi-chain upgrading" (Navas-Aleman 2011).

Recent developments within the global economy and archetypal GVCs suggest that in order for sub-Saharan African (SSA) countries in the twenty-first century to effectively adapt to the emergence of tiers of suppliers, they must address the underlying factors of their logistics capabilities.

This includes progressing from being a supplier located at the lowest tier within the GVC without full responsibility for delivery to end markets, towards assuming this role and therefore capturing and adding more value in the process.

Through comparative GVC case study analysis, which draws on the comparative GVC upgrading experiences of producers in the cut flower GVC in East Africa and the available evidence for firms that trade on an intra- or extra-regional basis in Southern Africa, including across multiple markets, this chapter underscores the importance of the logistics sector in terms of the development of producers' capabilities.

This chapter is organised as follows. In Sect. 7.1, we review aggregate trends in relation to sub-Saharan Africa's participation in GVCs and the influence of trade costs. In Sect. 7.2, these trends are reviewed alongside the available evidence on logistics capabilities. In Sect. 7.3, country-specific comparative value chain analyses are introduced. Finally, this chapter concludes regarding the role of the logistics sector in terms of the development of producers' capabilities. In view of the role of the logistics sector in relation to conventional value-adding processes, gaining control of the logistics sector can assist in enabling forms of upgrading, particularly multi-chain upgrading.

7.2 Economic Geography and Cost Considerations

An excessive penalty on integration with GVC is exerted on many African countries because of small domestic economies in addition to long distances from global centres of commercial activities. This results in economic disadvantages in view of excessive trade costs. These cost disadvantages must be considered within the context of available value-added shares being low at the entry level stages of GVC participation (Baldwin 2012).

As discussed by Shepherd (2016) and Arvis et al. (2017) one metric that provides an overall indication of a country's degree of integration with world markets comes from the ESCAP-World Bank Trade Costs Database. This database provides a comprehensive measure of bilateral

trade costs as it incorporates all factors that drive a wedge between factory gate prices in the exporting country and consumer prices in the importing country. It therefore covers the full range of trade frictions, including tariff and non-tariff barriers, regulatory measures, standards, differences in cultural and legal institutions, and geographical and historical factors (Shepherd 2016). It means that bilateral data can be aggregated into a single number per country by calculating "average" trade costs, in the sense of a constant value for trade costs that, if applied to all bilateral partners, would result in the same level of total trade as is actually observed in the data.

7.2.1 Trade Costs for Sub-Saharan Africa

The results calculated for trade costs in SSA by Shepherd (2016) show that they are around twice as high as in the comparator markets, with the exception of South Africa, where they are around 1.5 times as high. This result, although indicative of the economic penalty exerted in view of geographical factors, also suggests that capabilities matter: although South Africa is geographically more distant from major markets than some other countries in the region, its trade costs are substantially lower.

In order to emphasise how value chains are networks of co-ordinated transactions rather than a linear series of point-to-point movements, Shepherd (2016) represents the value added in exports data in network form for agriculture and textiles and clothing respectively, taking 2000 and 2012 as the base years. In order to do this, only the largest export flows among regional partners and the UK and USA are considered. As discussed by Shepherd (2016), each country is represented as a box, and its largest trade flow is a line connecting it with the destination market. The results from this exercise are presented in Figs. 7.1, 7.2, and 7.3.

Within both of the archetypal GVCs, the UK and USA are evident as major sources of demand for SSA's value-added in both the agricultural and textiles and clothing sectors. These networks are seemingly rather stable over time and between 2000 and 2012, although in agriculture Mozambique moves from the UK-centric cluster to the USA-centric

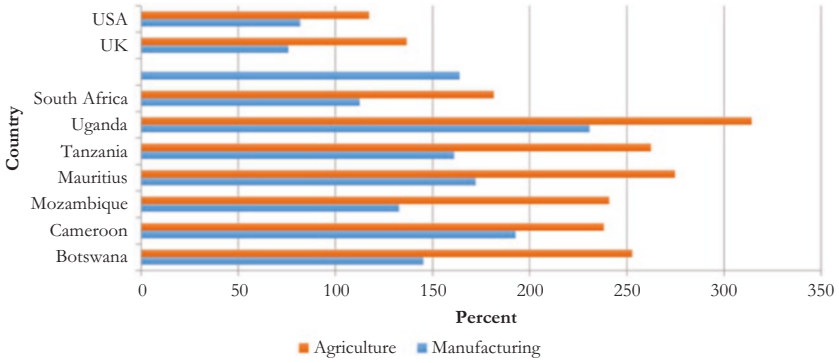

Fig. 7.1 Trade costs in agriculture and manufacturing, per cent ad valorem equivalent, selected countries, latest available year (2012). (Source: Shepherd 2016)

cluster, via a connection with South Africa. The data suggest that this particular country has developed stronger links with its large neighbour in agriculture, which in turn has led to an indirect linkage to the US market.

For agriculture, only two SSA countries have their largest export flows with another SSA country (South Africa). For textiles and clothing, the picture is somewhat different, with large chains predominantly connecting African countries to the USA. Mozambique has changed its position in the value chain over the period analysed to service the USA-driven textiles and clothing value chain to a greater extent than the EU-driven chain.

Although these results present us with some interesting shifts over time, they focus on vertically fragmented intermediate goods trade. This is because over the last two decades, some firms within particular sectors have internationalised to such an extent that their operations now span multiple national territories. The emergence of tiers of suppliers within GVC-trade has become more pronounced in recent years. Given this, a greater range of data are required in order for policy-makers to make better sense of the new GVC phenomenon with respect to trade in goods and services, including in the logistics sector—a key horizontal enabler—which have accelerated under the recent globalisation processes.

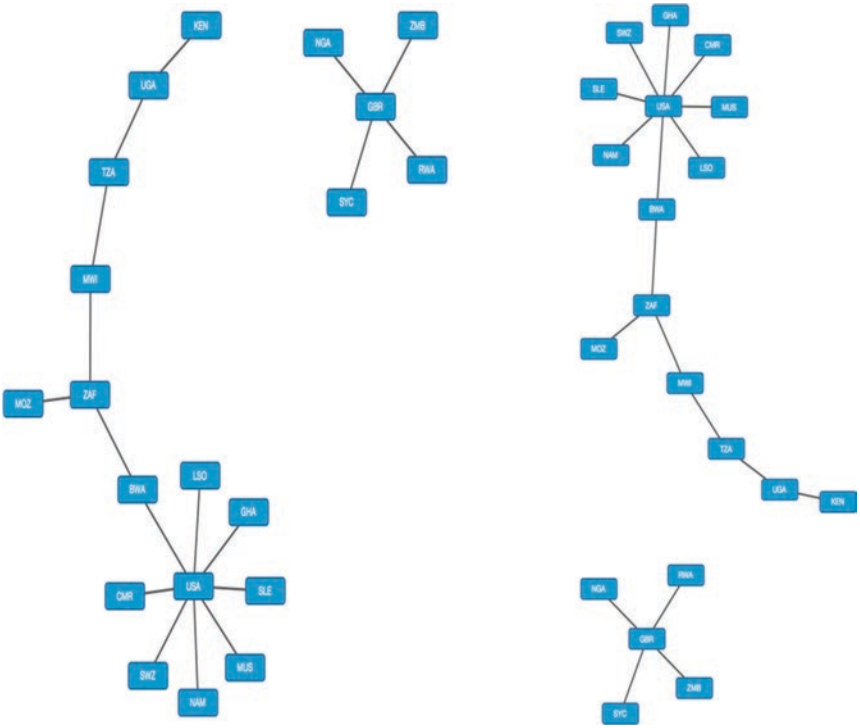

Fig. 7.2 Network representation of value-added trade in agriculture in SSA, largest export flow only among the partners considered, 2000 (top) and 2012 (bottom). (Note: Country codes are Botswana (BWA), Cameroon (CMR), Ghana (GHA), Kenya (KEN), Lesotho (LSO), Malawi (MWI), Mauritius (MUS), Mozambique (MOZ), Namibia (NAM), Nigeria (NGA), Rwanda (RWA), Seychelles (SYC), Sierra Leone (SLE), South Africa (ZAF), Swaziland (SWZ), Tanzania (TZA), Uganda (UGA), Zambia (ZMB), UK (GBR), and the USA; Source: Shepherd 2016)

Although new understandings of how countries are positioned within GVCs have been made available through the creation of input:output tables this descriptive analysis fails to illuminate further on the incentives to fragment and relocate different parts of a production process.[1] There are recognised tensions between the comparative costs that create the incentive to "unbundle" some parts of a production process, compared to agglomeration forces that seek to bind parts of a process together and facilitate co-location (Baldwin and Venables 2013).

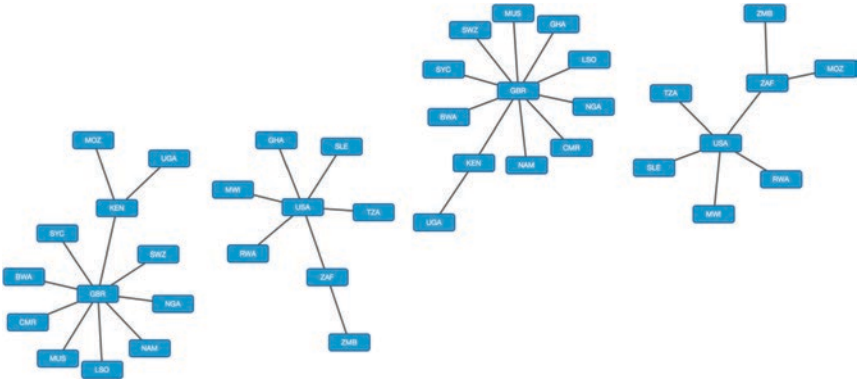

Fig. 7.3 Network representation of value-added trade in textiles and clothing in SSA, largest export flow only among the partners considered, 2000 (top) and 2012 (bottom). (Note: Country codes are Botswana (BWA), Cameroon (CMR), Ghana (GHA), Kenya (KEN), Lesotho (LSO), Malawi (MWI), Mauritius (MUS), Mozambique (MOZ), Namibia (NAM), Nigeria (NGA), Rwanda (RWA), Seychelles (SYC), Sierra Leone (SLE), South Africa (ZAF), Swaziland (SWZ), Tanzania (TZA), Uganda (UGA), Zambia (ZMB), UK (GBR), and the USA; Source: Shepherd 2016)

7.3 Logistics Capabilities

The penalties for trade inefficiencies are heightened within trade in tasks and GVCs, because value addition is accrued between stages of production that may straddle multiple borders. The import of goods and services is required before the subsequent export of goods. Many countries are only very weakly connected to global networks of trade in value added, and this is likely due to their correspondingly weak performance on metrics of air and maritime transport connectivity (Shepherd et al. 2016). The adverse influence of economic geography on trade costs can therefore be mediated by policies to enhance connectivity.

Efficiency within the aviation sector has been a key enabler of engagement with the high-value agriculture GVC. Maritime shipping linkages depend more on having high volumes for the development of links between countries. Closely linked to transport is the logistics sector, and there is much work suggesting that logistics performance is a key determinant of a country's ability to be competitive in global markets, including through joining and moving up in GVCs.

Some of the econometric results derived from recent analysis of SSAs connectivity to GVCs as proxied by shares of value added and logistics capabilities include the following[2]:

- The positive association between the World Bank's logistics performance index (LPI) and value chain connectivity suggests that regional value chains could be strengthened, and the SSA countries' competitive position improved, by upgrading overall trade facilitation performance through measures such as regulatory reform and private sector development.[3]
- Scores for SSA on the World Bank's air connectivity index and shifts in trade in value added are broadly in line with what would be expected given their ability to connect to global air transport corridors.
- In the case of maritime connectivity, using UNCTAD's liner shipping connectivity index, the results for SSA are broadly in line with what would be expected given its ability to connect to global shipping markets. However, there are some cases of countries below the regression line, which suggests that they are not taking full advantage of the opportunities offered by their maritime connectivity.

However, while much of the current GVC discourse has focused attention on connectivity in relation to trade costs, directly influenced by investment in the logistics sector, much more limited attention has been paid to the role of the logistics sector in terms of the development of producers' capabilities. This is an important omission that assumes a particular importance in view of the role of the logistics sector in relation to conventional value-adding processes: supporting development of the logistics sector can assist in enabling forms of upgrading. The ability to service multiple markets can also assist in enabling a type of "multi-chain upgrading" (Navas-Aleman 2011). Countries seeking to benefit from GVC participation need to address underlying factors of their logistics capabilities (Memedovic et al. 2008).

Thankfully, more recent additions to the literature, which apply econometric techniques, including factor content methodology, have been able to demonstrate the role of capabilities driving participation in GVCs (Pathikonda and Farole 2016). In these studies, proximity to markets

(which invariably reduces trade costs), efficient logistics coupled with strong institutions are the major drivers of GVC participation (Pathikonda and Farole 2016).

There is a need to more carefully distinguish between interventions designed to assist small and medium enterprises (SMEs) in entering into GVCs and developing relationships with lead firms. As summarised by Pathikonda and Farole (2016), this necessarily entails both understanding what it takes to attract lead firms' interest and the incentives for producers to upgrade to higher value-added activities.[4] Different strategies will invariably be required in view of the nature of GVC participation, with implications for public policy. Greater consideration must be paid to horizontal integration processes, which are particularly relevant within the logistics sector.

7.3.1 Multi-Chain Upgrading

Although not usually linked to horizontal integration processes, there is an emerging literature on "multi-chain" upgrading. This relates to the greater learning opportunities available to firms serving multiple markets. In particular, domestic firms may have more opportunities to launch their own manufactured and branded products in domestic or neighbouring markets, with similar levels of development. This literature draws on the experience of producers in the textiles and clothing industry in Kenya (Kamau 2009), and the furniture and footwear industries in Brazil (Navas-Alemán 2011).

Participation in multiple value chains provides the possibility of "leveraging competencies": different value chains create different possibilities for learning, and what is learned in one value chain can be applied in others (Lee and Chen 2000). A focus on domestic markets leads manufacturing firms to broaden the scope of their activities (i.e., functional upgrading) into design, marketing and branding. This may be because they have a better understanding of home markets than foreign markets, or it may be because domestic customers are not as powerful or concentrated as their counterparts in global value chains (Brandt and Thun 2010).

This aspect of upgrading within GVCs emphasises horizontal fragmentation processes, as opposed to vertical ones. Within particular

sectors, notably textiles and clothing, because of the challenges associated with moving towards taking control of some of the downstream functions within the textiles and clothing value chain, the traditional route of upgrading posited—from original equipment manufacturing (OEM) to original design manufacturing (ODM) and then original brand manufacturing (OBM) as described in Gereffi (1999)—has been replaced by other opportunities to increase the range of services offered to lead firms.

This is why the more recent distinction between a country that specialises in basic assembly and cut make and trim (CMT) (Tier 1) compared to another that is a full package supplier that takes control of the assembly of the product, including the sourcing of inputs as well as delivery to customers (Tier 2) is now made. However, the implication of these shifts in potential upgrading trajectories—the closing of some routes and opening of others—has not been adequately explored within the literature to date.

Movement by CMT producers into certain types of activities so as to become a full package supplier may generate powerful spillover effects. For example, the experience obtained with managing logistics could serve to attract similar basic activity functions of other industries. However, major questions remain as to the opportunities to functionally upgrade, as compared to previous decades, given the emergence of tiers of suppliers that specialise in particular functions.

Policy lessons for SSA's effective engagement with GVCs in the twenty-first century can be derived from the experiences of other exporters within the textiles and clothing sector. The most up-to-date summary of functional upgrading processes in the sector for Bangladesh is undertaken by Alam and Natsuda (2013). They find that most firms are engaged in what they term FOB-1 and FOB-2 production, which they describe as being analogous to the OEA, OEM and ODM descriptions and upgrading trajectory used within the GVC literature.[5] The terms are defined as follows:

- FOB-1 is a step above CMT production, whereby producers take responsibility for the sourcing of intermediate materials and production.
- FOB-2 includes the sourcing of intermediate materials and the undertaking of all levels of production and design.

Out of the 70 firms surveyed, 85% (56 firms) were involved with FOB-1 production, 6% (four firms) were involved with FOB-2 production and 9% (six firms) were involved with traditional CMT arrangements. They note that only four of the 70 firms surveyed offer finished products to retailers. This includes providing all necessary production material, including design and branding.

Although they do not distinguish between the end markets for these products they do note that, "most of the garment firms in Bangladesh are owned by domestic entrepreneurs who have limited capital, less experience, and little knowledge to carry out all necessary stages of production" (Alam and Natsuda 2013: 27). Competency in design was noted as a major barrier to entry by key informants in the sector. Overall, they conclude that although there is evidence of functional upgrading from CMT to FOB-1 production, the ability of firms to upgrade to FOB-2 is doubtful. They make reference to broad-based productive constraints, including weak infrastructure—a crucial component of logistics capabilities—as the reasons for this.

7.4 African GVC Case Studies

Despite the differences between the more recent quantitative additions to the GVC literature and that of the more qualitative wave of the 1990s, both perspectives recognise how global trade patterns have never been so interconnected. Moreover, that trading success within increasingly integrated global markets means entering and upgrading within GVCs. The ability of countries to do so depends on many of the policy measures applied at their borders, as noted by the traditional trade literature, as well as considerations related to institutions and economy geography. However, success also requires consideration of new issues and beyond the border measures.

It is recognised within the GVC literature that some upgrading processes may be easier to achieve within intra-regional value chains, precisely because these markets are less dominated by a few lead firms. Hence, supplying processed and branded chocolate may be more likely

for firms orientated towards intra-regional markets than more tightly controlled global markets, not only because of reduced competitiveness challenges but also because of similar tastes and cultural proximity. Barriers to entry within intra-regional markets may also be lower.

7.4.1 A Comparison of Kenya and Ethiopia

The high-value agriculture GVC has evolved in recent years to exhibit very similar tendencies to that of the textiles and clothing GVC. Because of this, and in view of recent developments in both sectors, this subsection presents a comparative analysis of recent upgrading processes in Kenya and Ethiopia. These are then subsequently related to the development of logistics capabilities and the ability to meet demanding "just-in-time" requirements.

Since the 2000's, around six UK retailers account for the direct sales route in the case of Kenya, and around half of these in recent years have been supplied directly by one major firm, a subsidiary of a major trans national corporation (TNC) (founded in 1750, originally as a trader and manufacturer of cotton). In recent years, because of continued growth in the sector, however, Kenyan leading firms have emerged. One of these recent entrants now ranks as one of the largest producers and exporters of fresh produce from Kenya and is among Kenya's top five flower exporters. Subsequently, the company has become part of a group that has expanded production into neighbouring countries such as Ethiopia and Ghana. In relation to the operations undertaken overseas, these have grown from production towards packaging and exporting, as well as into logistics, energy and general trading. This process of intra-sectoral upgrading has also begun to be replicated by other leading firms in the sector.

The available evidence suggests that Kenya is favoured as a preferred supplier mainly in view of its compliance infrastructure, a component of logistics capabilities (Table 7.1). In comparison, Ethiopia is viewed favourably in terms of cost. One aspect of this cost differential conferred to Ethiopia results from its status as a least developed country, compared to Kenya.

Table 7.1 Country capabilities

	Kenya	Ethiopia
Hectares	3400 (in 2010)	1600 (in 2010)
Main products	Range of products available: roses; other decorative flowers High value rose products (geographical factor)	Roses ~ limited flower product
Main destinations	66% UK; 17% Netherlands; 5% Germany; 12% other	84% Netherlands; 8% Germany; 8% other
Strengths	Certification and trust in compliance infrastructure: business to business and retailer specific Pool of skilled labour force Ten-year corporate income tax holiday Exemption from VAT and customs import duty on inputs Business support services, including industry associations Political stability	Cost competitive; incentives provided to investors Cheap labour force Ease of doing business Tax holiday for five years; duty free import of input materials Credit and finance available
Weaknesses	Perceptions regarding pesticide residue issues in the past (e.g., MRL) Perceptions regarding labour standard and rights issues, e.g., minimum wage legislation Difficult to start a business and register property; complex land management and administration Taxes are problematic with poor co-ordination among government agencies Labour is no longer low cost	Weak compliance infrastructure; delisted from some standards compliance (e.g., Sedex) Weak post-harvest technologies Labour standard and rights issues, e.g., minimum wage legislation Air freight dictated by government Lack of trade promotion support
Trade policy	Uncertainty regarding the EU-EPA negotiations was problematic and costs were borne due to a failure to conclude negotiations in advance of the deadline set by the EC Market access has been secured	LDC status and security of tariff rent available in EU market. Willingness to work with buyers and industry representatives, e.g. CBI Netherlands

Source: Adapted from Rikken (2011 and 2012)

7.4.1.1 Upgrading Opportunities, Including Multi-Chain

The range of upgrading opportunities for producers in the modern agricultural sector are similar to those available to new entrants into the textiles and clothing GVC. A form of functional upgrading could entail sales on the domestic market. Gaining control of logistics and supplying retailers with a flower product may be considered broadly comparable to movement from FOB-1 to FOB-2 suppliers in the textiles and clothing GVC (Keane 2017). A form of upgrading entails moving from supplying fresh cut flowers, towards the supply of complete bouquets and flower "product".

There is evidence of Kenyan cut flower firms moving towards a position of a full package supplier, with responsibility for sourcing all inputs, as in the case of a more relational type of GVC governance (Keane 2013). In this respect, it is fairly safe to say that Kenya is an FOB-2 type supplier. In comparison, Ethiopia remains at the FOB-1 stage of production. It mainly supplies fresh cut flowers (roses) mainly to Dutch auction houses; some supply is destined for UK retailers.

As described by Keane (2017), the comparison of GVC engagement in the cut flower GVC in Kenya and Ethiopia suggests there is evidence of a type of East African "flying geese" in action. This is taking place as investors in Kenya begin activities in Ethiopia, which is a lower cost producer of cut flowers. Ethiopia has been inserted into the cut flower GVC through a strong FDI-led process, with a specific focus on the supply of cut flowers to Dutch auction houses. It has exhibited an impressive performance to date in relation to the volume of cut flowers exported. There is evidence of some functions, notably logistics, being handled by the Kenyan firm.

The emergence of tiers of suppliers therefore includes some Kenyan lead firms, which also act as intermediaries, controlling production and supply to retailers, including from Ethiopia—because they have developed the logistics capabilities to do so. These results are interesting in a number of respects because they represent an aspect of the multi-chain hypothesis that is under-explored in the literature—horizontal integration. The development of formidable logistics capabilities invariably underpins these recent trends.

The evolution of the cut flower GVC suggests that some Kenyan lead firms have extended their range of services undertaken within the sector

across a number of countries, including Ethiopia. As described by Keane (2017), this is essentially a form of intra-sectoral upgrading, which is not currently conceptualised within the GVC governance structures identified by Gereffi et al. (2005). Intra-sectoral upgrading induced through improvements in logistics capabilities has occurred even though functional upgrading in the conventional sense, into international services such as sales and marketing, has not been achieved.

7.4.2 Firms in Southern Africa[6]

Firms based within the South African Customs Union (SACU) are highly likely to be subject to major or severe customs and trade regulations compared to most other regions (Keane et al. 2010). As major and severe customs and trade regulatory barriers are experienced, the more likely it is that Southern African firms export on an intra-rather than an extra-regional basis (Keane 2015).

In the following sub-sections, the results of the econometric exercise undertaken by Keane (2015) are summarised. This analysis moves beyond trade cost considerations in order to explore the capabilities underpinning the choice of export markers. It explores indictors related to GVC participation. This includes a customs, trade and regulation dummy variable as a proxy for logistics capabilities. Despite the limitations inherent in the research methodology, which are reflective of a more general lack of information on GVC-related firm-level indicators, differences between firms trading products mostly on an intra- and extra-African basis have been identified, which arguably warrant further attention.

7.4.2.1 Empirical Analysis

First, the results specifying γ as a dichotomous outcome variable, coded as = 1 if SACU firms only supply the domestic market, are presented in Table 7.2. These results suggest older firms are less likely to supply domestic markets, as is the case for those that are foreign owned. Firms selecting the domestic market are also less likely to encounter major or severe customs and trade regulations—an obvious result. Although the effect of firm size is

Table 7.2 Firms orientated to the domestic market

	B	S.E.	Wald	Sig.	Odds ratio Exp (B)
Ownership dummy	−3.917	0.221	313.795	0.000**	0.020
Manager's experience (years)	0.14	0.009	2.424	0.119	1.014
Firm age (years)	−0.14	0.006	4.846	0.028**	0.987
Customs, trade regulations dummy	−5.69	0.315	3.271	0.071*	0.566
Labour regulations dummy	−0.141	0.302	0.219	0.639	0.868
Workforce dummy	0.327	0.243	1.802	0.179	1.386
Size (no. of employees)	0.000	0.000	5.659	0.17**	1.000
Formal training dummy	−0.261	0.192	1.848	0.174	0.770
Constant	4.066	0.262	241.451	0.000	58.308

Note: *N* = 1652. The labour regulations, customs/trade regulations and workforce regulations dummy variables take a value of 1 if firms report these policy and institutional variables to have either a severe or major (negative) effect on production. Goodness of fit indicators: Cox and Snell 0.281; Nagelkerke R Square 0.511

Source: World Bank Enterprise Surveys and UN Comtrade; Keane (2015)

* = significant at 10% level; ** = significant at 5% level

significant, its influence in terms of the odds ratio is ambiguous: it neither increases nor decreases the odds of firms selecting the domestic market.

7.4.2.2 Results: Intra- and Extra-Regional SACU Exporters

The potential differences between firms that export goods traded mainly on an intra- or extra-regional basis are explored. In order to do this we first specify γ as a dichotomous outcome variable, coded as = 1 if SACU firms export mainly on an intra-regional basis. The results are presented in Table 7.3. The independent dichotomous variable is only coded 1 for those firms that produce products we definitely know are mainly supplied on an intra-regional basis (using our 50% threshold).

It is clear from the results presented in Table 7.3 that the policy/institutional barriers of customs/trade regulations and workforce regulations exert a significant influence (10 and 5% level, respectively) on the likelihood that a firm exports on an intra-regional basis. These results are easier to make sense of when we compare them to the results for extra-regional exporters. In Table 7.4 we specify γ as a dichotomous outcome variable, coded as = 1 if SACU firms export predominantly on an extra-regional basis.

Table 7.3 Results of logistic regression for intra-regional exporters

	B	S.E.	Wald	Sig.	Odds ratio Exp(B)
Ownership dummy	3.388	0.276	150.264	0.000**	29.599
Manager's experience (years)	−0.023	0.011	4.241	0.039**	0.978
Firm age (years)	0.006	0.007	0.650	0.420	1.006
Customs, trade regulations dummy	0.651	0.346	3.533	0.060**	1.917
Labour regulations dummy	0.390	0.338	1.330	0.249	1.477
Workforce dummy	−0.913	0.319	8.206	0.004**	0.401
Size (no. of employees)	0.000	0.000	0.124	0.725	1.000
Formal training dummy	0.287	0.223	1.650	0.199	1.332
Constant	−4.261	0.309	190.130	0.000**	0.014

Note: *N* = 1652. The labour regulations, customs/trade regulations, and workforce regulations dummy variables take a value of 1 if firms report these policy and institutional variables to have either a severe or major (negative) effect on production. Goodness of fit indicators: Cox and Snell 0.140; Nagelkerke R Square 0.349

Source: World Bank Enterprise Surveys and UN Comtrade; Keane (2015)

* = significant at 10% level; ** = significant at 5% level

Table 7.4 Results of logistic regression for extra-regional exporters

	B	S.E.	Wald	Sig.	Odds ratio Exp (B)
Ownership dummy	4.161	0.529	61.848	0.000**	64.115
Manager's experience (years)	0.022	0.013	2.981	0.084*	1.022
Firm age (years)	−0.015	0.011	1.958	0.162	0.985
Customs, trade regulations dummy	−1.359	0.640	4.513	0.034**	0.257
Labour regulations dummy	0.284	0.411	0.478	0.489	1.328
Workforce dummy	0.103	0.338	0.092	0.761	1.108
Size (no. of employees)	0.000	0.000	4.184	0.041**	1.000
Formal training dummy	0.117	0.285	0.169	0.681	1.124
Constant	−5.875	0.572	105.373	0.000**	0.003

Note: *N* = 1652. The labour regulations, customs/trade regulations and workforce regulations dummy variables take a value of 1 if firms report these policy and institutional variables to have either a severe or major (negative) effect on production. Goodness of fit indicators: Cox and Snell 0.105; Nagelkerke R Square 0.365

Source: World Bank Enterprise Surveys and UN Comtrade; Keane (2015)

* = significant at 10% level; ** = significant at 5% level

It may be expected that firms which trade predominantly on intra- and extra-regional bases exhibit differences related to the indicators we use as proxies for GVC participation. However, what has been revealed through this analysis is how firms that export on an intra-regional basis are more likely to experience problematic customs, trade and regulatory barriers, which may reflect weak logistics capabilities. Moreover, firms are less likely to export on an extra-regional basis if these logistics capabilities are weak.

To some extent these results further substantiate the empirical findings of Keane et al. (2010). Although this analysis could be improved in a number of ways—for example, interaction terms could be introduced, as well as the use of panel data to explore whether firms begin exporting on an intra-regional basis—nonetheless, the results are suggestive of important differences in relation to logistics capabilities and the likelihood of exporting on an intra-regional basis within Southern Africa, which deserves further attention.

7.5 Concluding Remarks

Much of the current mainstream interpretation of the GVC discourse focuses on these aspects of trade costs, which are directly affected by the logistics sector, but much more limited attention is paid to the role of the logistics sector in terms of the development of producers' capabilities. This is an important omission that assumes a particular importance in view of the role of the logistics sector in relation to conventional value-adding processes. Through comparative case study analyses of firms in Eastern and Southern Africa, within archetypal GVCs such as the textiles and clothing and high-value agricultural sectors, this chapter demonstrates why this is an important omission.

The comparison of GVC engagement in the cut flower GVC in Kenya and Ethiopia provides some evidence of a type of East African "flying geese" in action. This is taking place as investors in Kenya begin activities in Ethiopia, which is a lower-cost producer. Ethiopia has been inserted into the cut flower GVC through a strong FDI-led process, with a specific focus on the supply of cut flowers to Dutch auction

houses. It has exhibited an impressive performance to date in relation to the volume of cut flowers exported. There is evidence of some functions, notably logistics, being handled by Kenyan firms. The evolution of the cut flower GVC suggests that some Kenyan lead firms have extended their range of services undertaken within the sector across a number of countries, including Ethiopia. This is essentially a form of intra-sectoral upgrading, which is not currently conceptualised within the GVC governance structures identified by Gereffi et al. (2005). Intra-sectoral upgrading has occurred, even though functional upgrading in the conventional sense into international services such as sales and marketing, has not been achieved (Keane 2017). With regards to firms in Southern Africa, the results of an econometric exercise undertaken by Keane (2015) to explore firm-level performance across different types of value chains reveal differences between firms' trading products mostly on an intra- and extra-African basis, which warrant further attention.

Through comparative GVC case study analysis, which draws on the upgrading experiences of producers in the cut flower GVC in East Africa and the available evidence for firms that trade on an intra- or extra-regional basis in Southern Africa, including across multiple markets, this chapter shows that weak logistics capabilities may reduce the ability of firms to service multiple markets and the upgrading opportunities which may result.

Notes

1. Although there are three main types, the UNCTAD/Eora database has the most country coverage.
2. These results are presented in Shepherd (2016).
3. The World Bank's logistics performance index (LPI)—a weighted average of six indicators, and based on a survey of around 1000 logistics professionals—takes into account performance on trade and transport-related infrastructure, customs clearance, the ease of arranging competitively priced shipments, the ability to track and trace consignments, timeliness of delivery, and the competence and quality of logistics services.

4. See Pathikonda and Farole (2016).
5. This is derived from case study analysis of the automotive or electronics industry.
6. Adapted from Keane (2017) forthcoming.

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8

The Importance of the Services Sector for Africa

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8.1 Introduction and Literature Review

This chapter focuses on the transport, communications and financial services sectors in Africa, reviewing the state of these sectors, as well as the policies that govern them at regional level. It also analyses the importance of these sub-sectors in development and assesses the various approaches adopted by governments to regulate these sectors.

8.1.1 The Importance of the Services Sector

Evidence from economic development worldwide shows that the growth of the services sector tends to go hand in hand with growth in gross domestic product: in richer economies, services tend to account for higher shares of economic activity (Economic Commission for Africa 2015a). Further, the emergence of global value chains reveals the close link between services and the creation of value in the exchange of intermediate products. The trade in value-added data recently developed by the Organization for Economic Co-operation and Development suggests that the value of trade in services, when taken from a value-added perspective, may be approaching half of world trade exports (45%) (Economic Commission for Africa 2015a, b). In addition, global value chains rely on well-functioning transport, logistics, finance, communication and other business and professional services to move goods and coordinate production along the value chain (Organization for Economic Co-operation and Development 2014).

The Economic Commission for Africa's *Economic Report on Africa 2015* states that,

> the emergence of services and the increased fragmentation of global value chains (into 'tasks') have the potential to substantially rebalance the 'old economy' distribution of comparative advantages based on natural endowments of developing countries. By creating a competitive advantage in a service tasks, countries can overcome traditional obstacles such as being a small market, being landlocked and being remote thanks to information and communication technologies (World Bank 2014a). Moreover, the fragmentation of production in global value chains and information and communication technology development open up opportunities for small

> and medium-sized enterprises to participate in the global economy by reducing the threshold and capital necessary to enter markets for intermediate goods and services (tasks). Within Africa, Kenya and Uganda are already well-known success stories in business and [information and communication technology] services exports.

In addition, the report notes that "inexpensive and good quality service inputs (domestic or foreign) can enhance competitiveness in agriculture, mining and manufacturing sectors. According to the [Organization for Economic Co-operation and Development], as much as 30 per cent of value-added of the manufacturing sector's exports is accounted for by services inputs."

8.1.1.1 Services in Developing Countries

Services remain similarly important when the focus is turned to developing countries and least-developed countries only. In 2011, the services sector accounted for an average of 47% of gross domestic product in least-developed countries. Least-developed countries' commercial services exports more than doubled from USD 9 billion in 2005 to USD 22 billion in 2011, growing much faster over that period—at 138%—than total world commercial services exports—at 70% (International Trade Centre 2013). The United Nations Conference on Trade and Development (2013) points out that despite an 18% drop in global foreign direct investment (FDI) in 2012, the services sector was the least affected, and FDI inflows to least-developed countries hit a record high—an increase led by developing country investors. Similarly, United Nations Conference on Trade and Development (2017a, p. 21) points out that FDI in 2015 was concentrated in the services sector, with FDI stocks in services being valued at USD 16 trillion worldwide (compared to USD 10 trillion for manufacturing, primary commodities and unspecified sectors combined). Announced greenfield FDI projects destined for least-developed countries were concentrated in services, with the sector accounting for USD 32 billion of such investments out of a total of USD 44 billion across all sectors (Ibid., p. 83).[1]

Further, World Bank research shows that the services sector has become a dominant driver of economic growth in developing countries, delivering

both growth in gross domestic product and poverty reduction. The research shows that services growth has a strong poverty-reducing effect across 60 countries (including 29 in Africa, excluding North Africa). Indeed, between 1990 and 2010, growth in agriculture and services was found to be strongly associated with poverty reduction, while the growth of industry did not have a significant effect on reducing poverty (World Bank 2014a). A study focusing on Southeast Asia also shows that services have the strongest impact on poverty reduction in that region (Warr 2002).

8.1.1.2 The Service Sector in Africa

Evidence on Africa suggests that services play a similarly important role there as elsewhere in the world. Table 8.1 shows evidence on the correlation between the growth in services value-added and growth in value-added of other sectors, as well as that of gross domestic product and gross domestic product per capita.

Table 8.1 Correlations between growth in services value-added, growth in value-added of other sectors, growth in gross domestic product and gross domestic product per capita growth—sample of 53 African countries, 2000–2012

Correlations	Growth in services value-added	Growth in industry value-added	Growth in manufacturing value-added	Growth in agriculture value-added
Growth in gross domestic product	0.86	0.70	0.81	0.90
Growth in gross domestic product per capita	0.87	0.67	0.80	0.86
Growth in services value-added		0.52	0.85	0.68

Source: Economic Commission for Africa calculations based on World Bank (2014c)

Data on growth in gross domestic product between 2000 and 2012 are available for 49 African countries. Data on growth in services value-added between 2000 and 2012 are calculated for 33 African countries. Data on growth in manufacturing value-added between 2000 and 2012 are calculated for 31 African countries. Data on growth in industry value-added between 2000 and 2012 are calculated for 32 African countries. Data on growth in agriculture value-added between 2000 and 2012 are calculated for 34 African countries

Indeed, in 2013 the services sector was the main contributor to gross domestic product in the majority of African countries—35 out of 54.

Across Africa, value added in services has grown more than value added in manufacturing, industry or agriculture over 2000–2012. Such correlation is higher than that between growth in manufacturing or industry value-added and growth in gross domestic product. Value added in services in Africa has seen a larger growth than value added in manufacturing, industry or agriculture over 2000–2012. Moreover, data show a strong correlation between growth in services value added and growth in gross domestic product for African countries over 2000–2012, at 0.85. This correlation is higher than those between growth in manufacturing or industry value added and growth in gross domestic product (respectively 0.70 and 0.81) (Economic Commission for Africa 2015a, b). This might be due to the fact that the services sector is employment-intensive and points to the potential of services to drive the continent's growth.[2] Only the correlation between growth in agriculture value added and growth in gross domestic product is stronger than the one for services, at 0.90: this might be due to the fact that agriculture still employs the majority of people in Africa.[3]

The correlation between growth in services value-added and growth in manufacturing value-added across African countries over 2000–2012 is also exceptionally strong, at 0.85, possibly pointing to the synergies between the two sectors (Economic Commission for Africa 2015a). The fact that value-added in services and in manufacturing move together suggests that services are necessary to support other sectors of the economy.

Services is also a leading driver of FDI into Africa: the share of FDI going into services in Africa reached 40% in 2012 compared to 24% in 2011 (United Nations Conference on Trade and Development 2013). According to Ernst and Young, in 2007 extractive industries represented 8% of FDI projects and 26% of capital invested in Africa; in 2012, they accounted for a mere 2% of projects and 12% of capital. In comparison, services accounted for 70% of FDI projects in 2012 (up from 45% in 2007), and manufacturing activities accounted for 43% of capital invested in 2012 (up from 22% in 2007). Other sectors where there has been a noticeable shift include information and communication technology (14%, up from 8%), financial services (13%, up from 6% in the previous year), and education. By 2016, the vast majority of announced greenfield

FDI projects destined for Africa (USD 71 billion out of USD 94 billion) were in the services sector (United Nations Conference on Trade and Development 2017a, p. 45).

Economic Commission for Africa (ECA) research has also found that the presence of a thriving services sector is essential for attracting investors into African businesses as it allows them to source the support services they need locally. The absence or lack of competitiveness of vital services such as banking, insurance, business support, telecommunications and transport can discourage investors from pursuing a business opportunity in a country.

8.1.1.3 Financial and Infrastructure Services

Economic Report on Africa 2015 summarises the evidence on the importance of financial and infrastructure services for development as follows.

> Infrastructure services such as energy, telecommunications and transportation are essential for firms to be competitive; financial services facilitate transactions and provide access to credit for investment; construction services are essential for business development; and legal and accountancy services are vital components of a thriving business environment.

In Africa, deficits of infrastructure have a clear impact on African competitiveness and this has been found to undermine growth by as much as 2 percentage points and reduce productivity by as much as 40% (African Union 2014; Foster and Briceña-Garmendia (eds.) 2010). The lack of adequate transport infrastructure undoubtedly reduces Africa's ability to participate in the world economy. Most African countries also find it hard to compete in the world market owing to inadequate, inefficient and very expensive telecommunications services (World Trade Organization 2013). High transport costs in West Africa present a greater barrier to trade than regional import tariffs (World Bank 2008). It has been reported that the key factors that can increase operating costs for international firms include transport and communications infrastructure services. Concerted action to raise the average performance of countries in these sectors to half the level of best practice could increase global gross domestic product by almost 5%, six times more than would result from removing all remaining import tariffs

(World Economic Forum 2013a). There is immense potential for increasing global trade, and thereby economic growth, by reducing supply chain barriers. The global transport and logistics sector plays a key role in releasing this potential and Africa is no exception (World Economic Forum 2013b).

In the financial sector, "African countries cite lack of access to finance as a major obstacle to business development, the provision of financial services on the continent is particularly important for the future growth of African businesses" (Beck and Cull 2014; Pesce and Abdallah 2014; Economic Commission for Africa 2015a, b; Economic Commission for Africa, World Trade Organization and Organization for Economic Co-operation and Development 2013).

Moreover, studies since 2009 have also demonstrated that information and communication technologies, including mobile phone development, have contributed significantly to economic growth in Africa in recent years, in particular by promoting financial inclusion through mobile financial services (Andrianaivo and Kpodar 2011).

As such, the infrastructure and financial services sectors appear to play an important role in Africa's development.

8.2 Overview of Trends and Patterns in the Service Sector in Africa

The following bullet points give a summary of the trends in Africa's service sector. This is then followed by more detailed material on these trends and patterns.

- Services are an increasingly important component of African economies and trade. In recent years, Africa's exports of computer and information services, financial and insurance services, have seen strong growth. Country experience, however, shows that growth in such services does not always support local firms.
- Over the past decade, Africa's exports of services have grown significantly in absolute value.

- Services are an important component of Africa's exports.
- Services have an essential role in Africa's economic transformation: they are key inputs to most other businesses, make a direct contribution to gross domestic product and job creation, attract investments into local businesses and are a magnet for FDI.

In 2012, services were the sector with the largest contribution to gross domestic product in 35 out of 53 African countries. Seychelles, Djibouti and Mauritius topped the list of African countries with the highest share of services in gross domestic product. Further, over the past two decades, services were the fastest growing sector in Africa: from 1995 to 2011, they accounted for 62% of cumulative growth in gross domestic product per capita on the continent, compared to 24% for industry and 13% for agriculture (World Bank 2014b).

As shown in Fig. 8.1, Africa's growth in services output over 2000–2012 was higher than the world average and faster than that of several other regions (Fig. 8.2).

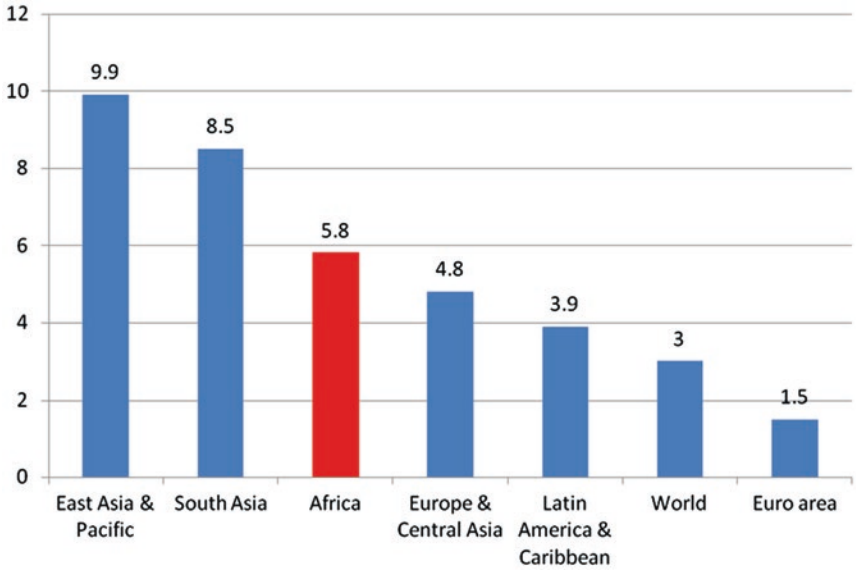

Fig. 8.1 Average annual growth in services output by regions 2000–2012. (Source: Authors' calculations based on World Bank (2014c))

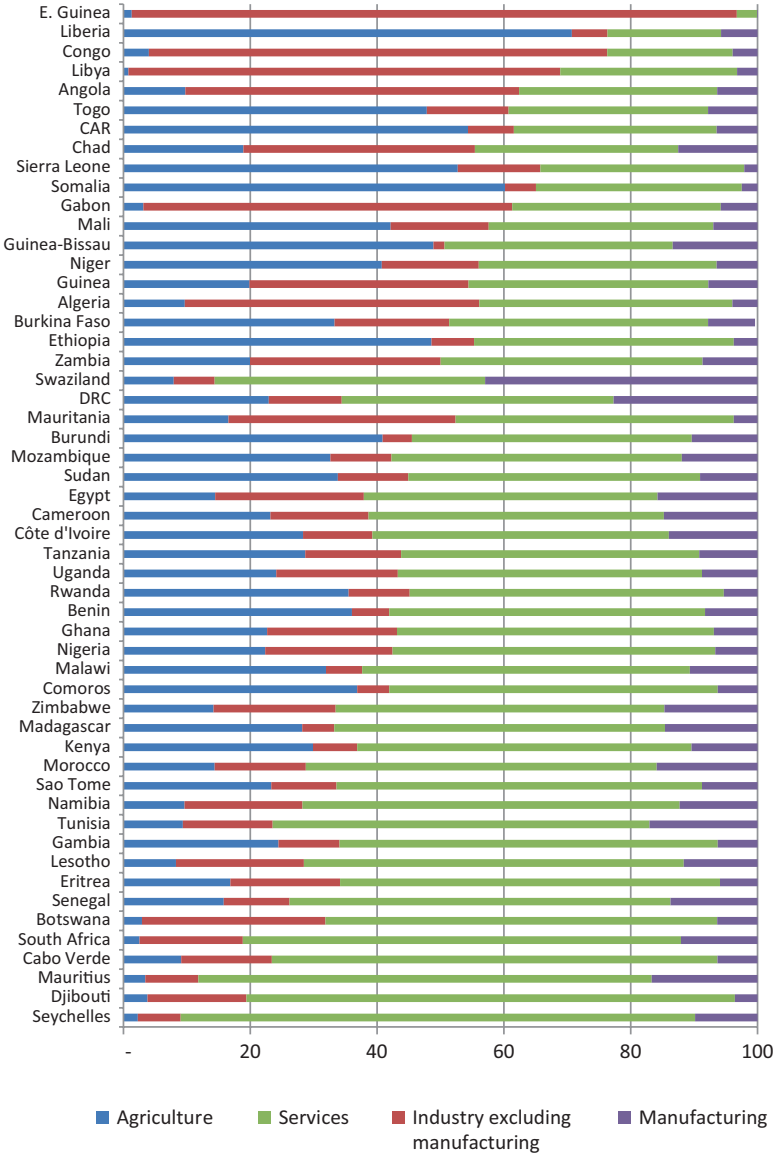

Fig. 8.2 Contribution of the main sectors to gross domestic product across African countries, 2013, in increasing order of services contribution. (Source: Authors' calculations based on African Development Bank, African Union Commission and Economic Commission for Africa (2014))

Services offer an option for economic transformation for countries, such as small island states (e.g., Seychelles, where services value-added was 81% of gross domestic product, or Cabo Verde with 70%) or small landlocked states (e.g., Botswana or Lesotho, where services value-added was 62% and 60% respectively of gross domestic product), for which manufacturing might not be the best development option (World Bank 2014c; Economic Commission for Africa 2015a). It is interesting to note that African countries with a relatively high share of services in gross domestic product tend to be resource-poor: the correlation between the World Bank natural resources rents index and the share of services in gross domestic product is strong and negative, at −0.73.[4]

Equatorial Guinea, Ethiopia and Liberia were the African countries that saw the highest growth in services value-added over 2009–2012, respectively 31%, 14% and 11%. In Equatorial Guinea, services have grown significantly to support the booming oil and mining sectors and driven by government investments. The government focused on improving transport, electricity infrastructure and public buildings (hospitals and schools) as part of its National Economic and Social Development Plan 2008–2012 (PNDES).

In Ethiopia, the service sector was estimated to have grown by 9.9% in 2012–2013, mainly driven by expansion in wholesale and retail trade (34.4%), transport and communications (17.1%), hotels and tourism (15.4%), and other community services (African Development Bank, Organization for Economic Co-operation and Development and United Nations Development Programme 2014).

In Liberia, the services sector experienced around 9% growth in 2013 and contributes around 44% of gross domestic product. Its main activities include trade and hotels, government services, real estate, construction, and transport and communication (African Development Bank, Organization for Economic Co-operation and Development and United Nations Development Programme 2014).

In Nigeria, Africa's largest economy, telecommunications and ICT contributed 10.4% of growth in gross domestic product between 2010 and 2013. Other business services contributed 8.7%, finance and insurance 7.5%, entertainment and music 3.7%, and professional and technical services 2.6%. Overall, services contributed to more than 50% of Nigeria's growth in gross domestic product between 2010 and 2013

(McKinsey Global Institute 2014).[5] This was much more than the contribution from the resources sector, contradicting the stereotype that Nigeria's economy is mainly driven by its oil.

Regarding Africa's trade in services, in 2013 all African countries for which data are available exported services. Africa's exports of services increased from USD 11.5 billion in 1980 to USD 32.7 billion in 2002 and USD 89.5 billion in 2012, a remarkable and continuous rise (International Trade Centre 2014; Economic Commission for Africa 2015a, b). This shows that Africa's services exports are competitive on international markets. If we were to assume that the international market for services is competitive, a marginal increase in the productivity of Africa's services sector would allow Africa to significantly increase its share in the global services market.

Figure 8.3 shows the breakdown of Africa's services exports by sector. Other business services, one of the fastest growing sectors of world trade today, which includes for example professional, technical and information technology-enabled business-to-business outsourcing services, was also a relatively large share of Africa's services exports in 2013 (6.3%).

These data reflect the importance of tourism for African economies, which accounts for 40% of Africa's services exports. Over 2000–2010, tourism receipts in Africa increased almost threefold.[6] Despite these encouraging numbers, tourism on the continent remains largely below potential due to constraints such as transport bottlenecks, insecurity, low quality of services, lack of investments, expensive aviation and scarce and

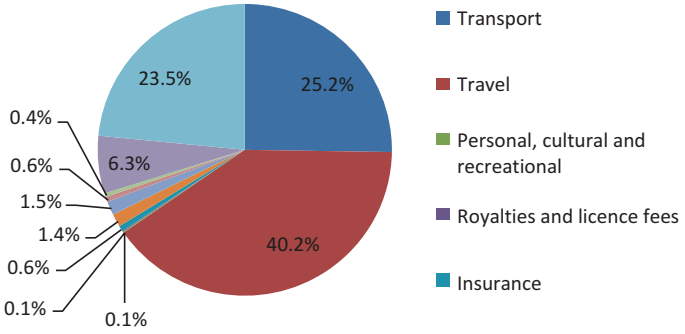

Fig. 8.3 Africa's exports of services by category, 2013. (Source: Authors' calculations based on International Trade Centre (2014))

costly accommodation in capital cities. Increases in aviation into Africa appear to have been a key factor behind this increase in tourism receipts. Over the same period (2000–2010), the number of air passengers arriving into Africa doubled over the period, reaching 62.6 million people in 2010.[7] South Africa, Egypt, Ethiopia, Morocco, Nigeria and Algeria have particularly strong aviation sectors: airlines from these countries carried between 4 million (Algeria) and 17 million (South Africa) passengers in 2012.[8] South Africa, Ethiopia, Egypt and Kenya also carried the largest amounts of freight in 2012. Despite these successes, flying across Africa remains much more expensive than flying across other world regions (*The Economist* 2013). All of this highlights the importance to the continent of a strong aviation sector.

As shown in Fig. 8.4, the composition of Africa's exports of services changed significantly over recent decades. Between 2002 and 2012 the shares of travel, transport, construction, insurance, financial services, computer and information and royalties and license fees increased within Africa's exports of services.

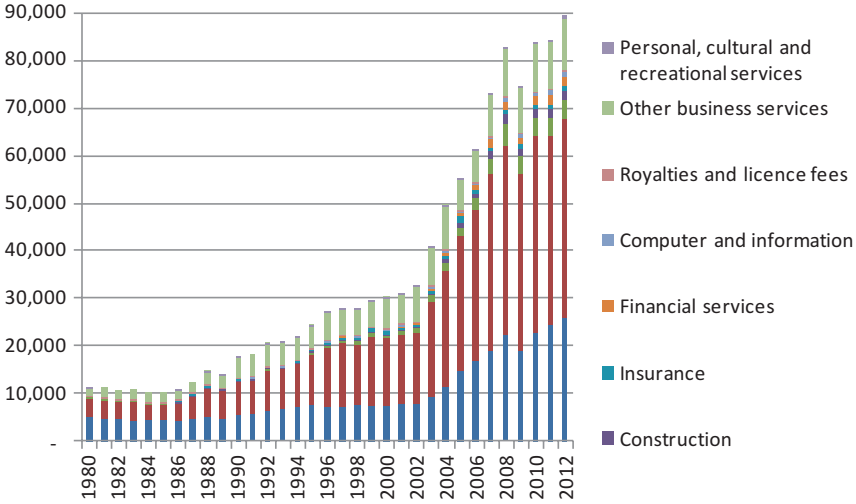

Fig. 8.4 Africa's exports of commercial services by category in absolute value, 1980–2012 (USD millions). (Source: Authors' calculations based on International Trade Centre (2014))

As shown in Table 8.2, the category of Africa's services exports that saw the fastest year-on-year growth between 2002 and 2012 was computer and information services (+20% per year on average) (Fig. 8.5).

As shown in Fig. 8.6, Africa's imports of services have grown significantly over the past decade, jumping from USD 76 billion in 2005 to USD 96 billion in 2016 (at 2016 prices). African imports of services jumped from USD 95 billion in 2005 to USD 144 billion in 2016 (at 2016 prices). Some 28 out of 38 countries for which data are available had services trade deficits in 2016, with notable exceptions including

Table 8.2 Average year-on-year growth of Africa's financial and infrastructure services exports by category, 2000–2013

Category of services exports	Average year-on-year growth 2000–2013
Computer and information services	20%
Financial services	11.6%
Insurance services	11.6%
Transport	10%
Communication services	9.8%

Source: ECA calculations based on International Trade Centre (2014)

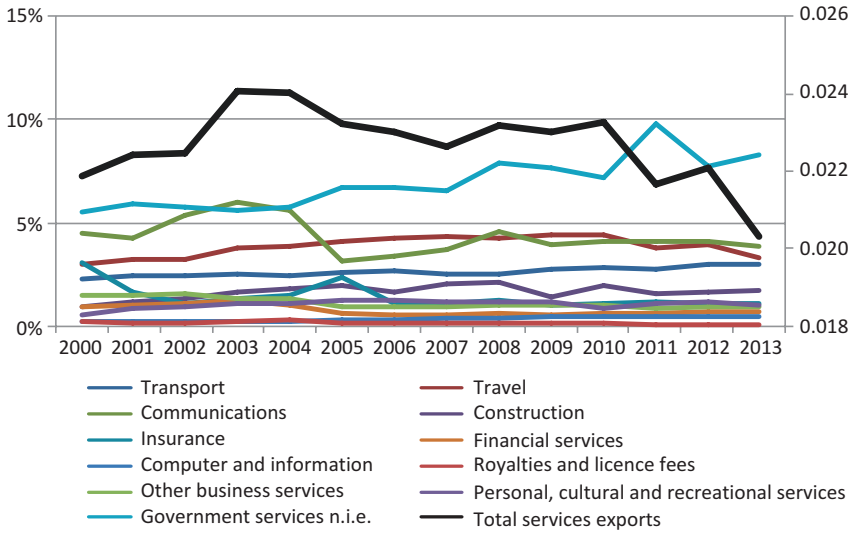

Fig. 8.5 Africa's share of the world's services exports by category, 2000–2013. (Source: Economic Commission for Africa analysis based on United Nations Conference on Trade and Development (2014))

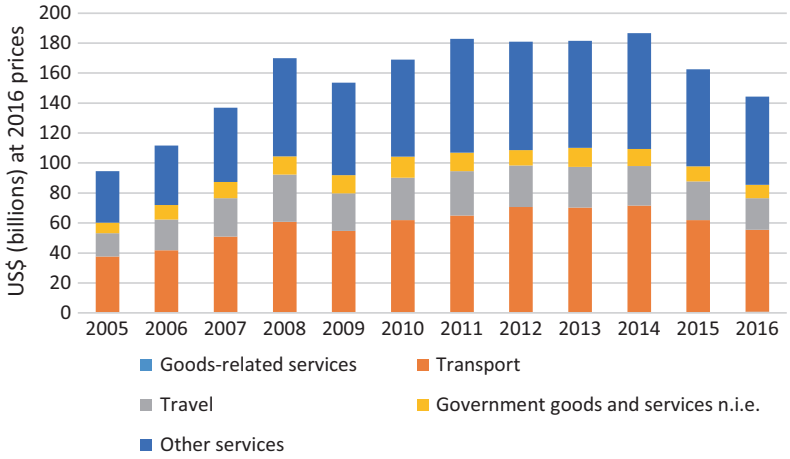

Fig. 8.6 Africa's imports of services by category (USD billions), 2005–2016. (Source: Authors' calculations based on United Nations Conference on Trade and Development (2018b and 2018c))

Morocco, United Republic of Tanzania, Mauritius and Kenya (authors' analysis based on United Nations Conference on Trade and Development 2018a and 2018b).

As shown in Fig. 8.7, Africa developed a trade deficit in goods in 2014 (in line with a decline in commodity prices). The continent's deficit in services has increased compared to 2005, though it started to narrow again after 2014 (with a trade deficit of USD 45.07 billion in 2016 in commercial services).[9] At the same time, Africa's exports of services have grown faster than the continent's exports of goods over 2005–2016 (increasing by 27% in real terms compared to an 11% reduction in goods) (authors' calculations based on United Nations Conference on Trade and Development, 2018b and 2018c).

The category of services imports that saw the fastest growth in Africa over 2005–2016 was goods-related services (up 150%), followed by other services (excluding government goods and services not included elsewhere) (up 71%). Some 12 out of 15 African countries for which data are available had a trade deficit in other services (excluding government goods and services not included elsewhere) in 2016 (authors' calculations based on United Nations Conference on Trade and Development, 2018a and 2018b).

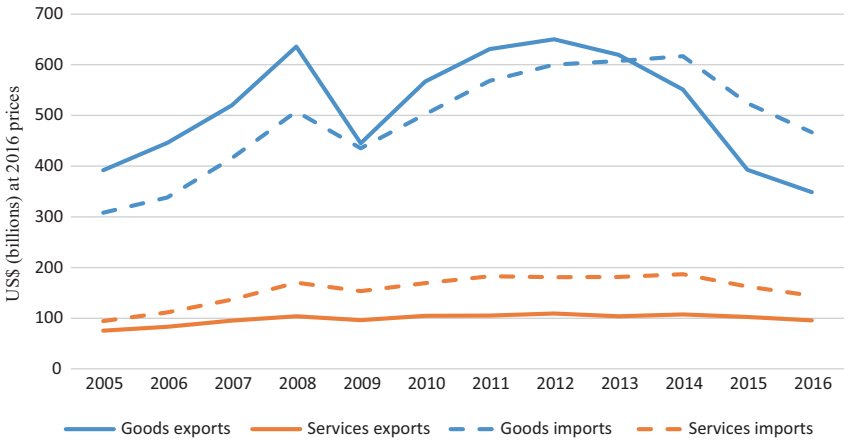

Fig. 8.7 Africa's imports and exports of goods and services, 2005–2016 (USD billions). (Source: Economic Commission for Africa analysis based on United Nations Conference on Trade and Development (2018b and 2018c))

Table 8.3 Africa's trade balance in financial and infrastructure services, 2012, ordered by largest export surplus

Services category	Trade balance in 2012
Communications	1565
Financial services	735
Computer and information	271
Insurance	(6151)
Transport	(32,961)

Source: Economic Commission for Africa calculations based on United Nations Conference on Trade and Development (2014)

Table 8.3 shows Africa's trade balance across the various categories of services exports in 2012 (for which more detailed data were available than for 2016) in decreasing order.

8.2.1 The Services Sector Is a Magnet for FDIs in Africa

Africa has been attracting an increased amount of FDI since 2000 as illustrated in Fig. 8.8. FDI into Africa remained resilient in 2014 despite growing financial market fragility and subdued global growth. Africa's

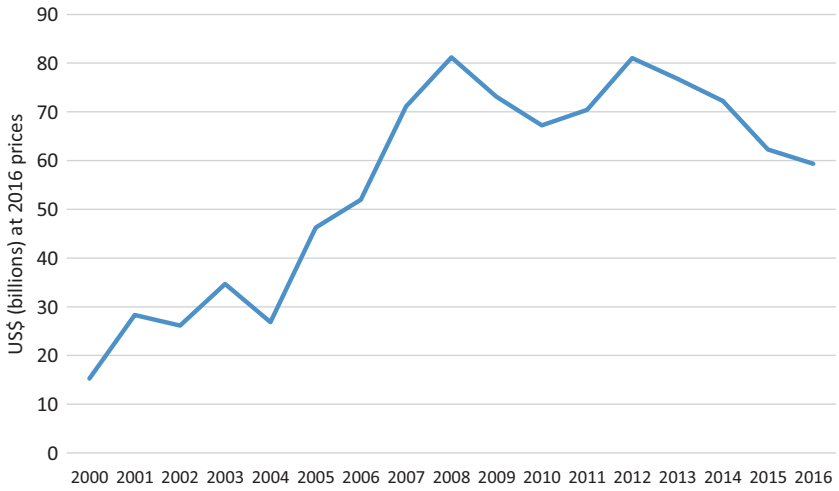

Fig. 8.8 FDI inflows into Africa (USD billions), 2000–2016. (Source: Authors' calculations based on United Nations Conference on Trade and Development (2018b and 2018d))

share of total global FDI inflows increased from 3.7% in 2013 to 4.4% in 2014. Total FDI inflows into the region recorded USD 54 billion, largely unchanged from the year before, whereas global FDI inflows fell by 16% to USD 1,230 billion. This resilience reflects the fact that intra-African FDI remains the most important source of FDI in Africa. The share of intra-regional greenfield investments by African firms in total announced greenfield investment in Africa was 76% in terms of value and 68% in the number of projects.

In 2000 not a single African country attracted more than USD 2 billion year-on-year in FDI inflows, while by the end of 2012 no less than eight countries on the continent had attracted more than USD 2 billion in FDI year-on-year (Blackie 2014).

The share of FDI going into services in Africa has been increasing, reaching 48% in 2014 compared to 24% in 2011. Finance, transport, storage and communications and business activities receive the largest shares of FDI in Africa—56%, 21% and 9% respectively. Hotels and restaurants were one of the most promising sectors for attracting FDI in Africa over 2013–2015 (United Nations Conference on Trade and

Development 2013). The importance of FDI in services is also evident in announced greenfield investment data. The sector accounted for the majority of greenfield FDI projects into Africa and the largest single portion of related planned capital expenditure in 2014.

However, services FDI is unevenly distributed. Services contributed 61% to the total FDI stock in North Africa in 2014, but only 45% in Africa excluding North Africa, where South Africa predominates. In 2014, approximately 47% of Africa's FDI inflows went to the top five host economies, namely, South Africa (USD 5.7 billion), Republic of the Congo (USD 5.5 billion), Mozambique (USD 4.9 billion), Egypt (USD 4.8 billion) and Nigeria (USD 4.7 billion). These are all countries with relatively large services sectors (apart from Republic of Congo). South Africa and Nigeria had particularly large services sectors that made up 68% and 56% of their GDPs respectively in 2014.

In 2013, Nigeria was the top destination for FDI in Africa. Although the oil and gas industry still accounts for the bulk of FDI inflows to Nigeria, a noticeable shift has begun over the past decade. From 2009 to 2013, the services sector received an estimated 51% of FDI inflows, up from 12% between 2004 and 2008 (McKinsey Global Institute 2014). This shows how services can be a valid option for economic diversification for resource-rich economies.

In 2011, Ghana and Morocco were the two African countries that attracted the highest FDI into services. Ghana's services received more than USD 5.9 billion, receiving the twentieth-highest quantity worldwide, just behind the United Arab Emirates with USD 6.06 billion. Dominant activities attracting services-based FDI in Morocco were business services, finance, hotels and restaurants and transport, storage and communications. Morocco was ranked 20 in the world for inward flows in the tertiary sector, just behind the United Arab Emirates (USD 6.06 billion) (International Trade Centre 2014). Over 77% of FDI inflows in Ghana's services were directed towards construction. The next African country on the list of most attractive destinations for FDI in services was Morocco, but at a distance, coming in at position 41, followed by Malawi (49), Tunisia (59) and Mauritius (65). Dominant activities attracting services FDI in Morocco were business services, finance, hotels and

restaurants and transport, storage and communications. This exemplifies how a well designed tourism sector such as that of Morocco can be a magnet for investments. In 2012, tourism was Morocco's top foreign exchange earner, the second biggest contribution to gross domestic product, and the second biggest creator of jobs. Based on such strong potential, the government has made tourism a national priority in its new Vision 2020, setting the goal of doubling the size of the sector, with a focus on sustainability and ecotourism. The Vision aims to create 470,000 new jobs, doubling tourist receipts to reach AED 140 billion (USD 15.3 billion), and placing Morocco in the world's top 20 destinations (it is currently ranked 25).

Private equity investment deals in Africa increased from USD 890 million in 2010 to US USD 3 billion in 2011, a 297% jump. Over USD 200 billion has been raised by private equity firms, with countries such as Kenya, Nigeria and South Africa being major beneficiaries. Private equity in Africa is particularly attracted by the services sector: in 2012, the four most popular sectors for private equity in Africa were reportedly business services, information technology, industrial products and telecoms, media and communications.

The services sector is an important employer in all African countries for which data are available: services employed between 48% and 53% of the workforce in the ten African countries for which data are available for 2010–2012, with peaks of 65% in Mauritius and 63% in South Africa (World Bank 2014c). These data show that services is a labour-intensive sector that can have a role in Africa's growth not only by supporting local industries but also by creating a large number of jobs.

8.3 Contributions of Infrastructure Services to the Sustainable Development Goals

This section focuses on the contributions of the financial and infrastructure services sector to the goals outlined in the Common African Position on the post-2015 development agenda. To recap, the Common African

Position includes the following goals where infrastructure services clearly have a key role to play:

- boosting regional integration and intra-African trade (which will be strengthened by good cross-border infrastructure services);
- enhancing Africa's participation in global supply chains;
- strengthening the role of migration in development (which can be supported through better transport, communication and financial services for migrants);
- promoting the sustainable exploration of Africa's resources: this would be furthered by strong transport services;
- an effective response to climate change in the document; this would be aided by infrastructure services being environmentally clean;
- improved domestic resource mobilisation; financial services have a role to play in organising this finance; and
- action against illicit financial flows. The financial services industry has a role to play in stopping these flows since it is a major conduit for their passage (Economic Commission for Africa 2015b).

The Common African Position also calls for improvements in infrastructure services to be included in the post-2015 sustainable development goals as an end in itself. In particular, in the African Common Position document, African governments, "Commit to:

(i) Improve linkages between the services and real sectors, inter alia, through: strengthened support to the agricultural and industrial sectors; improved coverage of broadband Internet services; and strengthening of telecommunications as one of the backbones of the service sector;
(ii) Stimulate home-grown innovations in service delivery, including by improving the quality and efficiency of public services, modern logistics, high-tech services, culture, e-commerce, tourism and health-related services (e.g. elderly care); and
(iii) Accelerate international development exchanges and cooperation in this sector." (African Union 2015)

The Common African Position also states that African Governments, "are determined to:

(i) Develop and maintain reliable, sustainable, environmentally friendly and affordable infrastructure in both rural and urban areas with a focus on land, water and air transport and storage facilities, clean water and sanitation, energy, waste management, Information and Communication Technologies (ICT);
(ii) Implement infrastructure projects that facilitate intra-African trade and regional and continental integration including, with the assistance of the international community, enhancing research and technological development and the provision of adequate financial resources; and
(iii) Promote the delivery of infrastructure programmes such that they generate local jobs, strengthen domestic skills and enterprise development, as well as enhance technological capability." (Ibid.)

The African Common Position on the post-2015 development agenda also proposes the following additional roles for infrastructure services:

- financial deepening and inclusion and deepening capital markets;
- increased access for youth to financial services;
- improving the efficiency and delivery of transport.

In addition, the Common African Position also calls for the inclusion of the following goals for which the role of infrastructure services may be less clear:

- economic growth;
- poverty reduction;
- food security;
- smallholder agriculture productivity improvements, including the extension of credit to improve the productivity of smallholder agriculture;
- job-rich growth;
- innovation (R&D spending);

- gender parity in education;
- HIV, TB and malaria reduction;
- and maternal and child health improvements.

8.4 Opportunities for Further Research

It may be useful to collect data on trade in infrastructure services, in particular identifying the source and destination of infrastructure services trade (i.e., which countries are exporting infrastructure services, and to which countries they are exporting them and to what extent). This may indicate where Africa (and indeed other continents) has the opportunity to improve its infrastructure services through reducing trade barriers in this area with a particular trading partner country. The difficulty is in obtaining such data on services. One way to achieve this might be to consult with regulators of the financial and infrastructure services sectors, which may have a rough idea of the main export destinations from their country and the extent of exports to other countries.

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Disclaimer The views expressed in this chapter are the authors' own and do not necessarily reflect those of their respective institutions.

Notes

1. That being said, United Nations Conference on Trade and Development (2017a, b, p. 21) also underlines that reporting practices somewhat inflate data on foreign direct investment in services.
2. Economic Commission for Africa calculations based on World Bank (2014c).

3. Economic Commission for Africa analysis based on World Bank (2014c).
4. The World Bank's total natural resources rents indicator shows the sum of rents from all kinds of natural resources including oil, natural gas, coal, mineral and forest rents, as a share of gross domestic product. Rents are defined as the difference between the value of production at world prices and their total production costs.
5. When including construction, real estate, public administration, finance and insurance, ICT and telecommunications, entertainment and music, professional and technical services and other business services.
6. Economic Commission for Africa calculation based on World Bank (2013).
7. Economic Commission for Africa calculation based on World Bank (2013).
8. Economic Commission for Africa calculation based on World Bank (2013).
9. Economic Commission for Africa calculation based on United Nations Conference on Trade and Development (2014), including non-government services not categorised.

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9

The Role of Market Institutions in Trade and Economic Development in Africa

Bla J. C. Eba and John J. Struthers

9.1 Introduction

Agricultural products such as coffee and cocoa form a large portion of the export commodities in developing countries. Indeed, It has emerged from the literature that more than half of export earnings of more than 50 developing countries depended on three or fewer leading commodities in 1998 (World Bank International Task Force (ITF) 2000). In many of these countries, commodity production and trade affect the livelihood of millions of people, the government's fiscal revenue and public expenditure, as well as the country's trade balance, foreign reserve and creditworthiness (Xavier 2011; Cashin et al. 1999). Coffee is the developing world's biggest trading commodity, with an annual export quantity in the range of 4.8 million to 5.4 million metric tonnes, and an export value in the range ofUSD 5–12 billion over the period 1997 to 2005 (ICO, 2006

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cited in Gemech et al. 2009 p. 2). In Ethiopia and Rwanda, for example, coffee exports generated about 26% and 22% respectively in export revenue in 2009 (ADB 2010). Coffee accounted for about 12% of global supply and 11% of global exports between 2013 and 2014 (ICO 2014). Ethiopia is the largest producer in the region, with 6.5 million bags, followed by Uganda (3.7 million bags) and Côte d'Ivoire (1.9 million bags) (ICO 2014). The commodity is predominantly produced by smallholder farmers. In Ethiopia for example, smallholder farmers contribute more than 95% of total production, which highlights the important implications of market conditions on growth and poverty reduction in the country (ADB 2010).

Yet the sector suffers various constraints ranging from commodity price volatility, lack of access to financial resources, poor market intelligence and limited export market access. These longstanding constraints prevent countries in the region from fully harnessing the gains of commodity production and trade (UNCTAD 2015).

Coarse (1937, cited in Gabre-Madhin and Goggin 2005) argued that, a fundamental concern of all societies is how the economy is organised and how market exchange is co-ordinated. There are costs of using the market mechanisms, which may be reduced or eliminated by certain types of co-ordination in the market. He further identified two kinds of costs: the costs of discovering what the relevant prices are and the cost that may be saved by making a single long-term contract for the supply of goods and services instead of short-term successive contracts. At its core, then, the problem of economic order can be conceived as essentially a co-ordination problem, depending integrally on both information and on the nature of contracts (Gabre-Madhin and Goggin 2005).

On the one hand, information seems to be at the heart of the institutional problem of order. That is, the transmission of information on prices, quantities supplied, quantities demanded, actors and their actions, product quality and attributes, and processes are key to market co-ordination. The problem of imperfect, asymmetric or incomplete information, which in turn leads to decision-making with "bounded rationality" (Herbert Simon 1955), missing markets and risk (Stiglitz 1982), and high transaction costs (Williamson 1981), has been the focus of much economic literature.

On the other hand, contracts and the costs associated with negotiating and enforcing contracts are also at the heart of the problem of economic order. Fundamentally, as Hicks (1969) noted, even the simplest exchange involves a form of contract, where each party is abandoning rights over the things that he sells in order to acquire rights over the things he buys. Thus, all exchange is trading in promises, which is futile unless there is some reasonable assurance that the promises will be kept. Extending this concept, Douglass North (1990) has forcefully argued that "the inability of societies to develop effective, low-cost enforcement of contracts is the most important source of both historical stagnation and contemporary under-development in the third world". If North is right, then achieving a self-co-ordinated market order in Africa is the way forward to emerge from under-development and stagnation.

Many authors have suggested different ways in which firms organise activities such as commodity chains (Selwyn 2015) and supply chains (Connelly et al. 2013; Priem and Swink 2012). Scholars on commodity chains place the emphasis on industries and the authority and power relationships that have emerged within them to explain the role of a leading firm (Mahutga 2012)—a firm that shapes, controls, co-ordinates and distributes the value along the chain (Azmeh and Nadvi 2014). Thus, deriving from this, two distinct chains have been identified: the buyer-driven commodity chains (in which the leading corporation plays a central role as merchandiser and makes sure that all pieces of the business come together); and producer-driven commodity chains (in which the leading corporation plays a central role in production activities (Gereffi and Korzeniewicz 1994, cited in Hernández and Pedersen 2017).

Other authors have placed their emphasis on the analysis of supply chains, where the supply chain concept explains the firms' relationships with suppliers and customers to deliver product and services at lower costs. However, the value chain concept goes beyond the supply chain concept by explaining that entities may be connected and create a value that is a source of competitive advantage (Al-Mudimigh et al. 2004; Stabell and Fjeldstad 1998). It seems that it is the combination of these two latter concepts that underpins the idea of local commodity exchanges, which primary role as a market institution is to

connect the various actors in the commodity markets and to create value for these actors.

The aim of this chapter, therefore, is to contribute to the supply and value chain literature by examining how local commodity exchanges in Africa have co-ordinated the various actors in the commodity markets and the subsequent impacts of this co-ordination on transaction costs. It also analyses the value added to the agriculture marketing system.

9.2 Development

9.2.1 Background: Market Reforms and Its Impacts on Agricultural Supply Chains

Prior to the market reforms in the mid 1980s, the introduction of international price stabilisation programs and measures and the intervention of governments in the production and marketing of export commodities have meant that producers have benefited from fixed prices for their predetermined production (Akiyama et al. 2003; Gemech and Struthers 2007).

The rationale for such interventions was that governments accepted their interventions in primary commodity markets as part of the development policy framework (Akiyama et al. 2003). While the instruments of intervention varied across countries and commodities, a dominant architecture based on the marketing board (Deaton 1999; Kaplinsky 2004) emerged. Designed to stabilise producer incomes, they often served as a monopoly distribution network (Kreuger 1990), and administered domestic prices that were normally pan-seasonal, pan-territorial and detached from international prices (Gilbert 1999). Controls were frequently extended to cash crops, which had a strategic value as a source of foreign currency and tax revenues (Akiyama et al. 2003). Commodities were often useful revenue sources, and some policy-makers saw taxing commodity exports as the most convenient and practical way to finance state activities (Bates 1981).

However, in the mid 1980s, many developing countries adopted various economic liberalisation programmes (Akiyama et al. 2003; Gemech

and Struthers 2007). These programmes have meant reducing government involvement in pricing and marketing of export commodities and increasing participation of the private sector in these activities (Akiyama et al. 2003; Gemech and Struthers 2007). As result, there is a growing participation of financial investors in commodity markets, which has been intensely debated as a factor driving price volatility during the recent boom and bust in commodity markets (United Nations Conference on Trade and Development, UNCTAD 2011).

It can be argued that the overall aim of market reforms is to boost the efficiency of an economy. As such, it is expected that the market reforms that took place will enhance the productivity of the export commodities in the developing world and improve efficiency. This in turn is expected to generate growth and improve the lives of producers (Akiyama et al. 2003). Indeed, supporting this, Gemech and Struthers (2007) have argued that liberalisation is expected to bring benefits to producers with the introduction of more efficient markets. Even though they further provided empirical evidence that market reforms have enabled producers to allocate resources more efficiently in the production of coffee, it has emerged from the literature (Gemech and Struthers 2007; Xavier 2011; Akiyama et al. 2003) that the market reforms initiated in developing countries have increased the fluctuations in price and caused a sharp decline in countries' earnings (Khor 2005). In fact, there is evidence that the effects of falling commodity prices have been devastating for many countries. In sub-Saharan Africa, for example, a 28% fall in terms of trade between 1980 and 1989 led to an income loss of USD l6 billion in 1989 alone. In the four years from 1986 to 1989, sub-Saharan Africa suffered a USD 56 billion income loss, or 15–l6% of GDP in 1987–1989 (Khor 1993). For 15 middle-income highly indebted countries, there was a combined terms-of-trade decline of 28% between 1980 and 1989, causing an average of USD 45 billion loss per year in the 1986–1989 period, or 5–6% of GDP (Khor 1993). In the 1990s, the losses were greater. Non-oil primary commodity prices fell by 33.8% from the end of 1996 to February 1999, resulting in a cumulative terms-of-trade loss of more than 4.5% of income during 1997–1998 in developing countries. Income losses were greater in the 1990s than in the 1980s (UNCTAD 1999: p. 85). This evidence supports the arguments of

Castells (1998), Stiglitz (2002), Ismi (2004) and Sachs (2005): that reforms which have limited the governments' interventions and promoted the markets have failed to yield the desired result of sustained growth in most developing countries that implemented them. Moreover, Ismi (2004) noticed that by the late 1990s Latin America had experienced "its worst period of social and economic deprivation in half a century" (Ismi 2004, p. 9) after 15 years of implementing the IMF and the World Bank's imposed policies. Even though Stallings and Peres, and Stiglitz highlighted the success of Chile in the region (Stallings and Peres 2000, p. 204; and Stiglitz 2002, p. 18), Latin America financed USD 145 billion in debt payment between 1982 and 1988 at a cost of economic stagnation, increased unemployment and declined per capita income of 7%. Hence, the economies of American countries adjusted but did not grow (Todaro and Smith 2009, p. 681).

Unfortunately, the heavily reliance of African countries on agricultural commodities has exposed their economies to price risk. Indeed, the most significant problem that has resulted from the liberalisation identified in the literature is the price risk to which producers and intermediaries are exposed and their inability to deal with it (Krivonos 2004; Gilbert 1999 cited in Gemech et al. 2009).

9.2.2 Market Reform and Its Impacts in Côte d'Ivoire, Ghana and Burkina Faso

9.2.2.1 Côte d'Ivoire

As discussed above, the government body that was dealing with the marketing of export commodities such as coffee and cocoa prior to the market reforms was "la Caise de stabilisation" (commonly known as CAISTAB), established in 1960. CAISTAB was under complete control of central government and determined payments for all stages along the marketing chain, including the producers' remuneration. Producers' prices were meant to "reflect production costs" and provide "equal remuneration for all crops" (Akiyama 1988). Consequently, the ratio of producers' prices for both coffee and cocoa has remained

constant since the 1976/1977 season, in spite of divergent world prices. In theory, any surplus obtained by the CAISTAB at the end of a crop year should have been allocated to the price stabilisation reserve, expenditures for rural infrastructure, and agricultural credit schemes (Xavier 2011). Indeed, Ridler confirmed that the CAISTAB at one time, provided between one-half and two-thirds of public sector investment in Côte d'Ivoire. Unfortunately, returns on those investments were at best insufficient (non-existent at worst) to support a stable price after the collapse in the world market during the 1980s.

In 1998, CAISTAB was dismantled as part of the liberalisation process promoted by the World Bank (WB) and the International Monetary Fund (IMF) (Xavier 2011; Agritrade 2012). This led the Ivorian government to abandon price setting commodities such as coffee and cocoa, permitting the private sector to handle marketing and producer prices. Sine then, these commodities prices have fluctuated in response to world market conditions.

However, in 2011, as a precondition for an IMF-backed debt relief deal, the government launched new cocoa reforms (Agritrade 2012). The aim of the reforms is to raise and guarantee minimum farm-gate prices on a sustainable basis in order to ensure sustainable livelihoods to cocoa growers and encourage them to boost output and reinvest in their ageing and sometimes neglected plantations. The reforms are based on three pillars.

- A central body, le Conseil du Café-Cacao (CCC) (established in January 2012), with representatives of all stakeholders, is responsible for the management, regulation, development and price stabilisation of cocoa and coffee.
- A new marketing mechanism involves the forward sale of 70–80% of the next year's crop through twice-daily auctions. These forward sales auctions—due to end each year in August just before the new crop starts—allow the establishment of a benchmark price for the next crop year and ensure a guaranteed minimum share of 60% of the CIF (cost, insurance and freight) price to farmers. Forward sales started on 31 January 2012. A committee to monitor implementation of the reform was also created, as initially exporters boycotted the auctions, claiming

that the authorities had under-estimated the real cost of bringing cocoa and coffee to port and thus their reimbursement of handling costs.

- A reserve fund at the Central Bank of West African States (Banque Centrale des États de l'Afrique de l'Ouest—BCEAO) covers the risks beyond the normal operations of the price guarantee scheme in order to support the new marketing arrangements in a fiscally neutral manner. This fund, which could eventually reach FCFA 70 billion (some EUR 106.7 million), is to protect against the possibility of a future major drop in world cocoa prices. By mid September, Côte d'Ivoire had paid more than FCFA 47 billion (EUR 71.7 million) into this fund (Agritrade 2012).

However, the fall in cocoa prices seems to overshadow these reforms as prices declined from a high of USD 2713/tonne in July 2010 to a low of USD 1334/tonne on 7 December 2011. Cocoa finished on the London market at USD 1557/tonne on 7 November 2012. This generated a shortfall of 0.5% of GDP in Côte d'Ivoire's revenue. Farm-gate prices averaged CFA 500–650 per kg (EUR 0.76–0.99) in 2011/2012, compared to CFA 850–900 (EUR 1.3–1.37) in 2010/2011. The price decline had been forecast by many observers, since, as part of the introduction of the forward selling system, Côte d'Ivoire sold both its 2011/2012 and its 2012/2013 crop at the same time. Falling cocoa prices added to high oil prices and a weak European market have put pressure on cocoa planters, who are increasingly attracted by other crops such as rubber, which provides a steady income throughout the year. Falling international cocoa prices and the depreciation of the euro, following the on-going financial crisis in the Eurozone, led to the IMF reviewing its initial forecasts of cocoa revenues in 2012: "initially estimated at CFA 337.6 billion, cocoa revenues are expected to post an overall loss of CFA 55.7 billion" this year (IMF 2013). Moreover, because of falling cocoa bean prices and declining export volumes, cocoa export tax revenues will play a smaller role in the state's financial resources. It is forecast that the cocoa export tax should contribute some 2.3% to total Ivorian tax revenues, compared to 3.5% in 2011 and 2.9% in 2010 (IMF 2013).

9.2.2.2 Ghana

Prior to the reforms, the Ghana Cocoa Board (COCOBOD) fully controlled the internal marketing, exporting, grower prices and marketing margins (Xavier 2011). The Produce Buying Company (PBC), a subsidiary of the COCOBOD, bought coffee from producers and stored it in its warehouses after processing, inspection and grading (Xavier 2011). A different division of the COCOBOD, the Cocoa Marketing Company (CMC), handled external marketing. However, the cocoa sector in Ghana has not been an unmitigated success. Since the introduction of cocoa to Ghana in 1888, the crop has undergone a series of major expansions and contractions. For example, after emerging as one of the world's leading producers of cocoa, Ghana experienced a major decline in production in the 1960s and 1970s, and the sector nearly collapsed in the early 1980s. Unfortunately, unsustainable levels of government expenditure, an increasingly overvalued exchange rate, import licensing, inflation, price controls and heavy state involvement in the running of the economy (Tsikata 1999; Leith and Söderling 2000) led to a collapse in 1983 and the introduction of the Economic Recovery Program (ERP) became necessary. In 1984, COCOBOD underwent institutional reforms aimed at subjecting the cocoa sector to market forces. However, liberalisation was only partial as the government adopted what Ofosu-Asare (2011) called the "meso" or mid-way model to the reforms. Under the "meso model", the state fixed the producer price of cocoa after a recommendation by COCOBOD even though the internal market had been liberalised. COCOBOD played other important roles after the reforms: it regulated the activities of the private licensed buying companies (LBCs); provided seed money to the LBCs for their operations; implemented innovative programmes like Cocoa Disease and Pests Control (CODAPEC), hi-tech fertiliser application, and planting of hybrid cocoa varieties to enhance cocoa farmers output; and controlled the activities of the cocoa value-adding companies for example, by supplying them with cocoa beans (Ofosu-Asare 2011). The main aims of the cocoa sector reforms were to increase producers' prices, reduce COCOBOD's operational costs, and liberalise the internal marketing of cocoa (Toyi 1991, p. 174 cited in

Ofosu-Asare 2011). Here, the state maintained control of exports, but opened up the purchase of cocoa from smallholders, permitting private operators to buy at a price set by the state (Agritrade 2012). The government shifted responsibility for crop transport to the private sector. In addition, there was a measure of privatisation of the processing sector through at least one joint venture (Alderman and Paxson 1992). Following the ERP in 1992, the government liberalised all internal and external marketing of cocoa. Private traders were allowed to enter the market, and fixed prices and trading margins were abolished. The new marketing chain consists of commission agents that buy coffee from farms and registered exporters (LBCs). By 1994 46 companies held export licenses (ICO 2012).

Ghana appears to have done enough to fend off pressures for further liberalisation of the sector. To what extent it will strive to continue to pass on a higher share of prices to farmers without external pressures, and whether there is recognition of the benefits from appropriate management that survives political changes, are not clear (Kolavalli and Vigneri 2010). The affairs of COCOBOD are not as transparent as they should be, and the line between cocoa revenues and government finances remains blurred. Whether COCOBOD will be able to stabilise prices if the world market were to become more volatile than it has been in recent years is not known (Kolavalli and Vigneri 2010).

9.2.2.3 Burkina Faso

Like many other agricultural commodity dependent developing countries (ACDDCs), Burkina Faso was also affected by the market reforms. Prior to these reforms, the marketing of cotton was subject to a heavy government intervention in the 1960s through "contract farming" arrangements. These arrangements involved a state-controlled cotton company providing inputs (such as research on cotton improvement, farmer education services, fertilisers, loans and marketing services) in exchange for the farmers' outputs through exclusive purchase rights (IFPRI 2005).

These arrangements helped the state to protect farmers from free-market perils, including large-scale market fluctuations and difficulties in

accessing credit, which contributed to positive outcomes. However, even though these arrangements helped the producers in terms of faster adoption of modern inputs, high repayment rates and production growth, they were not flawless (Kaminski et al. 2009). The state system had exorbitant operating costs that reduced farmers' earnings, and inefficiencies in the structure of farmers' groups meant that farmers' repayment rates to the state ran only at around 40% (IFPRI 2005). The state was therefore accused of corruption, and by the early 1990s the cotton sector in Burkina Faso was in serious financial difficulties. Even though reforms became necessary, the Burkinabe government was highly systematic in its approach. Reforms were gradually introduced while learning lessons from other cotton producing countries that had implemented reforms, such as Benin (IFPRI 2005). This subtle approach has enabled Burkina Faso to experience a steady growth in the production of cotton, which accounted for about 60% of exports in the 2000s leading to a remarkable growth in the country's GDP per capita rising from USD 214 in 1997 to USD 260 in 2007 (USD 430 in real terms). Burkina Faso became Africa's leading cotton producer in 2006 and its leading exporter in 2007. Since Burkina Faso's reforms began, the number of households cultivating cotton has nearly doubled to more than 175,000 from 1996 to 2006, and cotton-related work has generated an estimated 235,000 new jobs that have directly and indirectly benefited around 1.8 million people.

However, as cotton production in Burkina Faso posted unprecedented growth in the 2000s, the share of cotton earnings in export revenues shot up from less than 40% in 1990 to 85% in 2007. At the same time, increased export dependency on cotton has exacerbated vulnerability to exogenous shocks over the past decade. This was characterised by a pattern of falling world cotton prices and rising input prices; a decline in local profitability and farm productivity; and poorly performing cotton firms that lack the ability, information, and resources to adjust to evolving international markets (Kaminski et al. 2009). Although cotton represents a large proportion of Burkina Faso's exports, its contribution of export earnings to GDP is small (10%) and trade openness is limited. Most of the country's growth is from domestic demand. Limited export earnings highlight the unsustainable growth path that Burkina Faso is currently on. Although the country's terms of trade have recovered since

the early 2000s, structural deficiencies have led to persistent trade deficits (Savadogo 2009).

Hausmann et al. (2007) noted that export sectors are key to economic growth, as they typically have a cascade effect on other sectors. Unfortunately the issue of commodity dependence in most developing countries exposes them to unbalanced growth patterns driven by a restricted number of export commodities traded on highly volatile world markets (Hausmann et al. 2007). Furthermore, these commodity markets are characterised by distortive policies and barriers to entry or participation for farmers in developed countries. Meanwhile commodity production and trade are the primary means of earning a living for millions of households. Commodity sector development is essential for poverty alleviation and overall economic development. Many ACDDCs faced with both high marketing costs and price volatility see commodity exchanges as an alternative way to manage risks and increase efficiency in a liberalised market environment (Gilbert 1996; Morgan 2001; Thurow and Kilman 2009).

9.3 The Place of Local Commodity Exchanges in the Agricultural Supply Chain Using the Principal–Agent Framework

Gemech et al. (2014) using a principal–agent (P–A) framework (application of the agency theory (AT) to the coffee market) have evaluated the efficacy of different interventions within the commodity markets in developing countries. They found that the issues affecting the commodities trading systems can be a multi-layered P–A problem and concluded that local commodity exchanges (LCXs) may resolve some of these P–A problems. The rest of this section analyses the agricultural marketing systems of some African countries before and after the market reforms using the P–A framework. It also discusses how LCXs are in the best position to become intermediaries that can make full use of the available range of modern commodity marketing, price risk and financing instruments to mitigate risks and ensure a transparent and fairer trading system in Africa.

Prior to the market reforms, heavy government intervention within the commodity market gave a monopolistic power to parastatals, such as the marketing boards (MBs), over the agricultural marketing systems. MBs then became the only channel for exports and imports, they controlled the state owned processing centres and administered domestic prices that were normally pan-seasonal, pan-territorial, and detached from international prices (Akiyama et al. 2001).

When applying AT to the commodity market, under these systems the P–A relationship was much clearer. In producing countries such as those shown in Fig. 9.1, MBs were principals to both farmers and their co-operatives. In consuming countries, however, MBs were agents for the international commodity agreements (ICAs), the role of which was

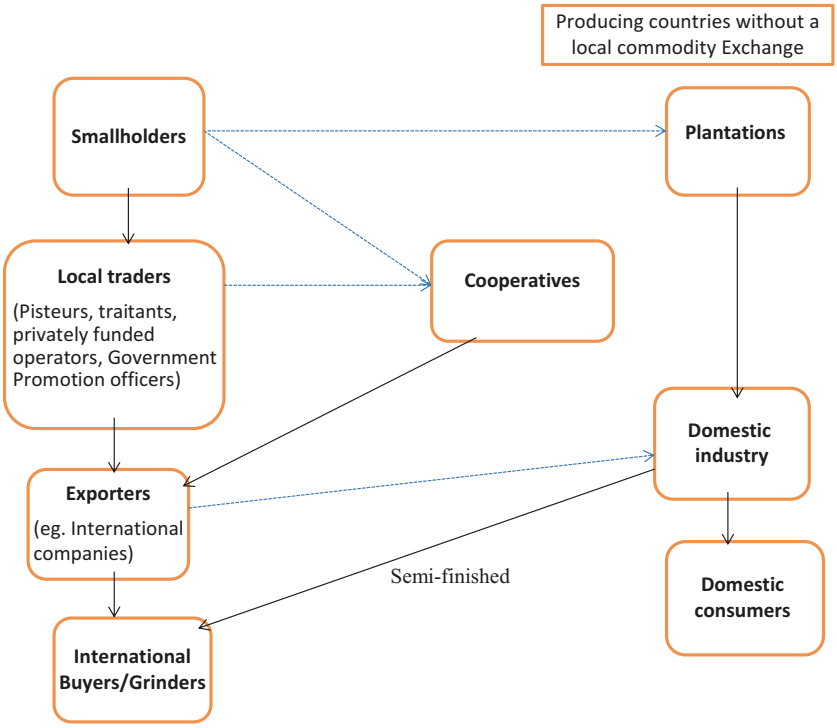

Fig. 9.1 Post-market reform basic cocoa supply chain in a country where there is no LCX. (Source: Authors' own figures)

to monitor the price of coffee through schemes such as buffer stocks, quotas, and so on.

The agricultural commodity marketing systems in Africa were state owned corporations whose relationship with farmers could be viewed as a nexus of contracts between the principals (MBs) and the agents (farmers) (Jensen and Meckling 1976). A typical example is the agricultural marketing system in Burkina Faso, which revolved round "contract farming" arrangements by which a state-controlled cotton company provided inputs (such as research on cotton improvement, farmer education services, fertilisers, loans and marketing services) in exchange for the farmers' output through exclusive purchase rights. A similar system characterised the agricultural marketing system in Côte d'Ivoire where CAISTAB assumed the task of governance without becoming involved in direct production processes.

The underpinning rationale of such governance mechanisms is that outcome-based contracts and information are believed to be effective in shaping the agents' opportunism. Given that humans can be self-interested, risk adverse and rationally bounded, the contract can align the preference of the principal with that of the agent because the rewards for both depend on the same actions. The agent therefore, is more likely to behave in the interests of the principal (Jensen and Meckling 1976). The P–A relationship under these systems is characterised by satisficing behaviour, rent seeking and shirking (Gemech et al. 2014). Governments frequently pursued policies that taxed agriculture in order to promote industrial development (Timmer 1991), and establishing an MB was a common means to achieve that. Commodities were often useful revenue sources, and some policy-makers saw taxing commodity exports as the most convenient and practical way to finance state activities (Bates 1981). Government-controlled systems also provided a source of political patronage. Politicians, for example, could reward supporters with trading licenses or high-level appointments to MBs. Furthermore, state management often provided politicians and government officials with funding for discretionary expenditures. Government control of key commodity markets created opportunities for corruption. Indirect taxes on export commodities provided financial benefits to the urban elite (Bates 1981) who were important political allies. To make planting decisions easier,

prices were frequently fixed for the crop year. To smooth annual price fluctuations, domestic prices were uncoupled from international prices. And to resolve regional disparities, fixed prices were pan-territorial so that all producers received the same purchase price. Governments obtained an economic gain from farmers products without there being any reciprocal benefits to the farmer. This is in line with the advocates of the AT argument that the corporation's primary objective is to maximise the shareholders' wealth, claiming society is best served by companies pursuing self-interest and economic efficiency (Friedman 1970). MBs did not empower farmers; they created the controls necessary to sway farmers to make decisions that are in their best interests (Jensen and Meckling 1976). However, high levels of corruption exacerbated parastatals' financial difficulties. This, combined with governments' fiscal problems made these systems unsustainable and prompted market reforms in many African countries (Akiyama et al. 2001).

Figure 9.1 shows that in a liberalised commodity market, producers have now been given the opportunity for direct trade. In some countries, such as India, producers have three ways of selling their products: they can sell directly to exporters, hold it at a curing factory before selling it, or sell it at voluntary auction (Akiyama et al. 2001). Currently most producers market their coffee directly to exporters. The exporters commission agents and provide them with a range of acceptable daily prices to buy from the growers. These agents, knowing that producers are unaware of the price range given by the exporters, often take advantage of producers by offering them the lowest price possible. Meanwhile, producers with very little information about the prices and unable to store their products have to take the prices offered. Since coffee producers began to trade their products on both the Multi Commodity Exchange and the National Commodity & Derivatives Exchange of India Ltd, their income has increased considerably (MCX 2014).

In other countries such as Ghana where a partial implementation of market reforms was adopted, MBs still play a role in the marketing of commodities, such as cocoa, by setting a minimum price for farmers, providing licences to traders, among other things. There are about 26 LBCs buying cocoa from farmers to sell to Ghana's COCOBOD (USDA 2012), which in turn exports it through its subsidiary, the Cocoa

Marketing Company Limited (CMC). The CMC is the sole exporter of cocoa in Ghana, and although a minimum tonnage criterion was also set for LBCs to export, only nine out of the 26 companies met the requirement, with none of them actually exporting cocoa to date (World Bank 2009). The quality control guaranteed by the government is carried out by the Quality Control Division (QCD), which undertakes grading and sealing of cocoa into export sacks.

The cocoa is transported from the producing areas to metal roofed sheds where it is weighed on certified scales. A thorough check of quality and moisture content is made by the manager of the storage facility, who usually provides a cheque to the farmer and keeps a detailed payment record. The marketing system in Ghana ensures a form of traceability of the product, which is founded on the requirement that cocoa bags are officially graded and sealed by the QCD as close to the farm as possible in the village buying sheds. Cocoa can then remain in villages for some weeks until an adequate quantity of sealed cocoa is gathered and transport is available. The buyer will then move the sealed bags to the "hand over point" where the cocoa is sold to the government-owned CMC at a fixed price. The cocoa is purchased by CMC through the LBCs, which means that the competition among LBCs is for the quantity purchased rather than the price, since the price is pre-determined by the government. Cocoa marketing costs in Ghana are relatively high at 15%, and the costs and margins of profit of the COCOBOD and its subsidiaries account for around 5% of the price of cocoa (Traoré 2009) in comparison to other Western and Central Africa regions. The margins paid by the government to traders is said to be among the lowest in the subregion due to the large exporter margins and taxes the industry has to pay to the government (Vigneri and Santos 2007). The cocoa value chain in Ghana can also be more costly due to the increased attention paid to quality. As such, the handling cost is increased due to the intensive quality assessment. One important objective of market reforms was to submit the commodity trade to market forces, providing producers with direct trade opportunities. This does not seem to be the case in Ghana where cocoa producers are still receiving pre-determined prices for their products. Even though these prices are amended according to the changes in the international prices, figures show that producers' share prices are

still low in Ghana. As identified by Gemech et al., (2014), one of the challenges brought by market reforms is that the P–A relationship has become multi-layered thereby making the supply chain more complex and ambiguous.

Furthermore, the direct trade system has brought profound changes in the way price risks are allocated and managed in commodity sub-sectors. Price risks are increasingly allocated to private traders and farmers rather than absorbed by the government. Unfortunately poor market information exchanges combined with farmers' lack of knowledge make price risk management on their part difficult, thereby exposing them to increased price volatility.

The old marketing systems in most African countries were designed to stabilise producers' incomes. Under these marketing systems, producers did not receive a large share of the export prices because of heavy government intervention and high marketing and processing costs. Government regulation of the domestic commodity markets, coffee for example, in the form of fixed producer prices and the monopoly of the MBs in Africa put a substantial wedge between the producer price and the world price of coffee by imposing an implicit tax on producers (Xavier 2011). However, these systems provided a certain degree of certainty to the producers because producers did not have to face the increased price volatility. In a post-reform market, producers have to acquire price information themselves and decide whether the prices that traders offer are adequate. Unfortunately, this has not been an easy task for producers because of the asymmetries of information within the commodity trading system. The problem is that imperfect, asymmetric, or incomplete information can lead to decision-making with "bounded rationality" (Herbert Simon 1982). Private traders are neither willing to invest in farmers' education nor disseminate market information to farmers and their co-operatives because asymmetries of information give traders an advantage over the farmers. Poor information exchange on market and price can lead to farmers getting a lower price than they deserve. In fact, there is a growing concern that private traders cheat farmers, concern that Akyama, et al. believe is unfounded. Yet, in Rwanda, farmers were happier to sell coffee cherries rather than parchment coffee because they felt "cheated" by coffee traders, some of whom used to penalise them by

unfairly lowering the assessed quality of parchment coffee (Murekezi 2009). Traders provide asymmetrical information in their favour, and downgrading the quality of coffee to justify paying a price below the Government of Rwanda (GOR) mandated price is one way of doing this in Rwanda (Murekezi 2009).

The overall objective of direct trade is to eliminate the power imbalances that exists in traditional supply chains. However, this does not seem to play out. Agricultural marketing systems in Africa continue to have difficulty coping with the competitive marketing situation introduced by liberalisation, whereas under the old system parastatals played a key role in marketing.

Furthermore, in many countries parastatals provided credit to producers, making access to credit much easier. Given the monopoly power that parastatals had over marketing, credit recovery was straightforward because repayments could often be deducted from the sums paid to producers. In a post-reform market environment, it is very difficult for small producers with no collateral to obtain credit from commercial banks. In many countries land is not properly registered and thus is not available as collateral, which exacerbates the problem (Akiyama et al. 2001).

Market reforms have established a link between domestic and world prices, thereby exposing producers to increased price volatility. These risks were absorbed by the government under the old system. With liberalisation, price risks are increasingly allocated to private traders and farmers who are ill prepared to manage them. Cocoa and coffee farmers, for example, face other difficult challenges such as rising production and high marketing costs, risks such as pests and diseases, and occasional inclement weather (Traoré 2009).

The success of market reforms depends on the ability of the emerging private sector to make full use of the available range of modern commodity marketing, price risk management (such as futures, options, swaps commodity bonds, and so on), and financing instruments. Because farmers do not generally have direct access to these instruments, intermediaries must be developed. LCXs seem to be in the best position to become these intermediaries because their interventions in the commodity market can yield significant economic benefits to all parties.

9.4 Local Commodity Exchanges Necessary Complement to Market Reforms

The market reforms in most African countries have resulted in improvement in performance of the agricultural markets in terms of significant re-engagement of the private sector in trade, improved market integration, and the reduction of marketing margins (Dadi et al. 1992; Lirenso 1993; Dercon 1995; Negassa and Jayne 1997; Dessalegn et al. 1998; Gabre-Madhin 2001). Nonetheless, these studies also point out that the reforms did not have the envisaged impact on agricultural growth and poverty reduction. This is mainly associated with the presence of prohibitively high transaction costs, evidenced by the lack of sufficient market co-ordination between buyers and sellers, the lack of market information, the lack of trust among market actors, the lack of contract enforcement, and the lack of grades and standards (Alemu and Meijerink, development co-operation, UK Ministry of Foreign Affairs 2010).

The persistence of these market constraints in Africa indicates that market reforms alone, defined as the removal of policy distortions, are necessary but not sufficient to enhance market performance. This suggests that the new development agenda, throughout post-reformed Africa, is to move beyond market reform to market development. In addition to policy incentives, key interventions are required to develop appropriate incentives, market institutions and build needed infrastructure, defined together as the "three Is of market development" (Gabre-Madhin and Goggin 2005) and that can be achieved through commodity exchanges.

There is no doubt that market liberalisation, the dismantling or weakening of MBs and the breakdown of ICAs have left the agricultural marketing systems in Africa weak and exposed. The LCXs seem to be a potential alternative to these organisations. Successful agricultural commodity exchanges, though by no means a panacea for all the weaknesses in the agricultural sectors in Africa, are seen as having the potential to improve the functioning of agricultural markets by improving price formation, market transparency and regional trade, thereby raising farm

output and rural incomes as well as enhancing food security (Onumah, UNCTAD 2012). A well-organised and successful LCX can reduce transaction costs because trading through a centralised exchange can reduce the costs associated with identifying market outlets, physically inspecting product quality and finding buyers and sellers. Successful agricultural LCXs hold the potential to reduce asymmetric information in favour of buyers/traders and may prevent the rise of oligopsonistic or monopsonistic power in some commodities purchasing. By reducing transactions costs and enhancing the flow of information, an exchange can improve returns to market agents while reducing short-term price variability and spatial price dispersion (Rashid et al. 2010) thereby increasing the income of farmers.

9.5 Have Local Commodity Exchanges Added Value to the Agricultural Marketing System? ECX as an Example

Prior to the establishment of the ECX, Ethiopia did not have a broad and co-ordinated market for the trade of agricultural products. Transaction costs were high, prices were not transparent and smallholder farmers often did not have market information on prices. These farmers net only a small profit because they lack storage facilities and telecommunications and transportation infrastructure. Moreover, multiple middlemen at every stage of the market chain further erode farmers' profits (ECX 2015). Indeed, these middlemen (intermediaries) were involved in many aspects of the supply chain and there could be as many as five of them in the supply chain. Thus the Ethiopian market, like most African countries' markets, lacked information, efficiency, transparency, order and integrity. There was an urgent need therefore for an improved mechanism to co-ordinate the various market actors, to help farmers earn more and ensure that Ethiopia gains more benefits from its agriculture sector. This led to the establishment of the ECX, which provides an integrated system of central trading, warehousing, product grade certification, clearing, settlement and market information and dissemination. The goal of the ECX is

to provide a marketplace where buyers and sellers can come together to trade and be assured of quality, quantity and payment. Figure 9.2 shows a more centralised trading system, connecting various actors in the value chain to the global value network.

Gereffi and Fernandez-Stark (2011) have defined the global value chain as a full range of activities that firms and workers perform to bring a product from its conception to end use and beyond, that are carried out on a global scale and that can be undertaken by one or more firms. Although each member in the Ethiopian coffee value chain adds value to the product—for example, some co-operative unions may process the coffee before selling it to the ECX or exporters—the focus here is on the ECX value addition. Rashid (2015) have argued that "a new institution should add value, and I struggle to find that value with African commodity exchanges". However, according to Porter's (1985) value chain analysis, it may be that through linking separate activities more effectively than competitors, a firm can gain a competitive advantage. Firms' organisation can add value, for example, centralised buying could result in cost savings. Thus, one can argue that the ECX plays an important role in co-ordinating the various actors in the Ethiopian commodity

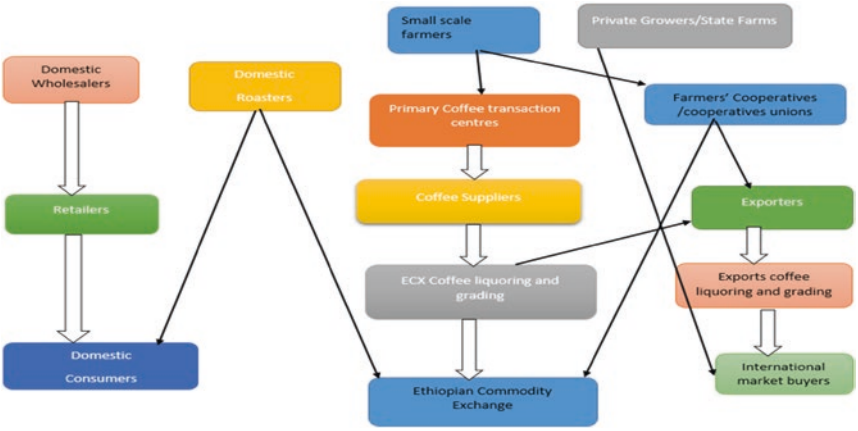

Fig. 9.2 Centralised trading system connecting various actors in a value chain to the global value network. (Source: Ethiopian value chain, adapted from Ethiopia Ministry of Trade, coffee opportunities in Ethiopia, (2012))

market as well as connecting local activities to international ones as shown in the Fig. 9.2. Therefore, reflecting on Porter (1985), it can be argued that the ECX has added value to the agricultural sector by centralising trade and reducing middlemen, which has resulted in lower transaction costs. Indeed, results from a comparison of transaction costs for the period before and after the ECX between Ethiopia, Côte d'Ivoire and Kenya using the percentage change analysis confirm this.

Table 9.1 shows a statistics summary of transaction costs for Ethiopia, Côte d'Ivoire and Kenya. Weekly data were converted into monthly data from November 2007 to December 2014

The mean values show that the average monthly transaction costs in Kenya (243.21 US cents) and Ethiopia (138.93 US cents) are high, Côte d'Ivoire has the lowest mean value (0.96 US cents). The standard deviations also show a wider dispersion in transaction costs in all three countries, Kenya shows the largest standard deviation (85.93) followed by Ethiopia (27.57) and Côte d'Ivoire (0.10).

The transaction cost in Ethiopia prior to the establishment of the ECX was as high as 226.67 US cents, this fell to 109.39 US cents after the establishment of the ECX with a mean of 138.93 US cents. The transaction cost in Kenya was even higher during the period before the ECX at 684.64 US cents, falling to 181.91 US cents after ECX. In Côte d'Ivoire, the transaction cost was also higher in the pre-ECX period (1.08 US cents) and fell to 0.40 US cents after ECX. Looking at the mean data, it seems that Côte d'Ivoire, without a commodity exchange, has the lowest transaction cost. In order to verify this further, the percentage change

Table 9.1 Statistic summary for transaction costs

Côte d'Ivoire		Ethiopia		Kenya	
Mean	0.96	Mean	138.93	Mean	243.21
Standard Deviation	0.10	Standard Deviation	27.57	Standard Deviation	85.93
Minimum	0.40	Minimum	109.39	Minimum	181.91
Maximum	1.08	Maximum	226.67	Maximum	684.64
Sum	66.19	Sum	9586.50	Sum	16781.55
Count	69.00	Count	69.00	Count	69.00

Source: Authors' own calculations

analysis is used to examine changes in transaction costs over the 7-year period (2007–2014).

In Ethiopia the maximum figure was 226.67 and the minimum 109.39.

$$\Delta = \frac{(226.67 - 109.39)}{226.67} = \frac{117.28}{226.67} \times 100 = 51.74\% \tag{9.1}$$

The percentage change in transaction cost in Ethiopia is **52%** (rounded up).

Côte d'Ivoire

$$\Delta = \frac{(1.08 - 0.40)}{1.08} = \frac{0.68}{1.08} \times 100 = 62.96\% \tag{9.2}$$

The percentage change in transaction cost in Côte d'Ivoire is **63%** (rounded up).

Kenya

$$\Delta = \frac{(684.64 - 181.91)}{684.64} = \frac{502.73}{684.64} \times 100 = 73.42\% \tag{9.3}$$

The percentage change in transaction costs in Kenya is **73.42%**.

The results of the percentage change analysis, indicate that transaction costs in Kenya and Côte d'Ivoire have increased by 73% and 63% respectively, whereas the increase in Ethiopia is only 52% over the 7-year period. Thus transaction costs in Kenya have increased by 20% more than in Ethiopia and 10% more in Côte d'Ivoire than in Ethiopia over the 7-year period. This finding confirms the results of the paired comparison t-test and is consistent with that of Andersson, et al. (2015), that the warehouse facility provided by the exchange reduces price dispersion and transaction costs. The finding is also consistent with the results of Meijerink (2014), showing a decrease in transaction costs for sesame traded on the ECX platform.

One of the major theoretical benefits of a commodity exchange is its ability to reduce the transaction costs of exchange (Jayne et al. 2014). Based on these results, one can argue that the ECX has added value to the Ethiopian trading system in contrast to the opinion of Rashid (2015). Indeed, the World Bank (2015) report on world development indicators shows that annual growth in agricultural value-added between 2005 and 2012 for Ethiopia is 8%, –1.75% for Côte d'Ivoire and 2.72% for Kenya.

9.6 Value Addition by Reducing Middlemen/ Intermediaries

Masters (2007 and 2008) has provided evidence that the presence of middlemen can reduce the efficiency of markets and that intermediaries are purely exploitative. One of the key objectives for establishing the ECX, therefore, was to reduce the number of these middlemen and make the trading system more efficient. According to the African Development Bank (2013), the results of an analysis of the ECX have confirmed that there was a reduction in transaction costs. Specifically, the results show that transaction costs have decreased in terms of (i) the average number of intermediaries each trader used (buying agents, brokers etc.); (ii) the average number of people consulted and involved to make a transaction per market day; (iii) the method or means of verification for sesame quality assurance; and (iv) time required per transaction (Meijerink et al. 2010). Paul (2011) argues that an exchange reduces transaction costs by facilitating contact between buyers and sellers, and enables centralised grading of products ensuring that contracts are enforceable. Similarly, Ngemenipuo and Issah (2015) have examined the challenges and economic prospects of establishing an organised commodity exchange in Ghana. They found that such a market will result in a reduction in post-harvest losses through price stability, provision of a transparent and competitive price discovery mechanism and reduction in transaction and marketing costs.

Furthermore, the authors have used an ordered logit approach to analyse 100 questionnaires from Ethiopian smallholder farmers. The results suggest that with one unit increase in reducing the middlemen variable, the ordered log odds of reducing transaction costs and improving profit increases by 2.38 if all other variables in the model remain constant.

9.7 Conclusions

Local commodity exchanges play an important role in the global value chain. Their primary role is to act as a market institution, connecting the various actors in the commodity markets and creating value for those actors. The ECX has shown that commodity exchanges can help to reduce transaction costs and improve farmers' profits by reducing the number of intermediaries involved in coffee trading. Results from the percentage analysis and the ordered logit all confirm that the ECX has had a positive impact on the Ethiopian trading system, thereby adding value to the agricultural marketing system.

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10

Can Trade Openness and Global Value Chains Improve Real GDP Growth and Human Development Index in Sub-Saharan African Countries?

Beatrice Isah Dara

10.1 Introduction

In this chapter, the author analyses the role of trade openness on the human development index (HDI) and economic growth in five Sub-Saharan African countries with the lowest HDI, using unbalanced panel data from 1980 to 2016. The use of the Hausman test allows the researcher to determine the right estimate for analysing panel data.

The HDI highlights the importance of using people and their capabilities as the "ultimate" criteria for assessing the development outcome of a country alongside economic growth. It is a "composite index" that measures the human development achievements of a country in terms of (a) health–life expectancy at birth or living a long and healthy life, (b) education–average years of schooling for adults and expected average years of schooling for children and (c) standard of living–the Purchasing Power

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Parity (PPP)-adjusted gross national income (GNI) per capita (see UNDP 2015). Over the years, the HDI measure has been accepted as an indicator for welfare comparison across countries due to its ability to capture multi-dimensional well-being variables (which are the life expectancy, knowledge and living standard) that extend beyond the purchasing power of personal income (Harttgen and Klasen 2012) and due to its simplicity (Hou et al. 2014). According to UNDP (2015), HDI can be used to examine national policy choices. It can compare countries with the same level of GNI per capita and question why they end up with different human development outcomes.

Nevertheless, this indicator has been criticised in terms of its methodology (Ravallion 1997; Grimm et al. 2008; Harttgen and Klasen 2012) as it does not measure variables such as inequalities, poverty, human security and empowerment. The indicator has also been criticised in terms of a development viewpoint. Literature has advocated that both social and development components, such as cultural freedom, human rights, access to social services, peace and security should be included in the measurement of the HDI (Noorbakhsh 1998; Sagar and Najam 1998; Anand and Sen 2000).

Correspondingly in the literature, trade openness has received positive recognition as a strong factor that influences economic progress, especially in the long run. Similarly, global value chains (GVCs) have received positive recognition as strong factors that influence economic progress through linking and co-ordinating global trade activities from the production of raw material, through the stage of finished product and to supplying the finished goods at global markets. GVCs link production stages from start to finish hence linking and co-ordinating activities of firms across countries. GVCs have provided poor countries with the opportunity to expand their export hence strengthening their integration into global economy. According to World Bank (2017), poor countries that are involved in GVCs have experienced rapid productivity growth, employment growth and an improvement in their standard of living and a decline in poverty. This chapter, therefore, aims to investigate the impact of trade openness, GVCs, education, foreign direct investment (FDI) and GDP per capita on the HDI in the sub-Saharan African countries that recorded the lowest HDI between 1980 and 2013, such as Chad,

Democratic Republic of Congo, Central African Republic, Niger and Sierra Leone. Data from UNDP's HDI show that these countries have the lowest rate of life expectancy, the lowest level of educational attainment and have the lowest standard of living in the world.

10.2 The Main Objectives of This Chapter

The contribution of this chapter lies in establishing the systematic link between trade openness, real GDP growth and human development for sustainable development and positive welfare outcomes in sub-Saharan African countries. The main objectives, therefore, will be to:

- explore the theoretical framework that links trade openness to economic growth, HDI and GVC;
- analyse the impact of trade openness on GVCs in sub-Saharan African countries;
- explore the impact of trade openness on HDI in five sub-Saharan African countries using panel data from 1980 to 2016;
- extend Cobb–Douglas production function by substituting technology growth with trade openness to estimate its relationship with economic growth within the context of the GVC; and
- use the Hausman test to determine the right estimation on HDI GVCs and economic growth models.

10.3 Theoretical Framework: Trade Openness and GDP Growth

The theory of trade openness or free trade can be traced back to the work of Adam Smith in 1723 and David Ricardo in 1772. They believed that trade surplus brought about economic progress. They also believed that trade with no restrictions was a channel that carried out the surplus produced in a country (export), for which there was little or no demand, to countries that had an increasing demand for the produce. This was a chan-

nel that also brought in products (imports) from other countries, which were not produced locally but where there was an increasing demand (Thirlwall 2006). Adam Smith, in his book *The Wealth of Nations*, highlighted that free international trade brings about global competition and economic growth. Furthermore, IIASA (2008) showed that free trade encourages: (a) exploitation of economies of scale in countries where more units of goods and services can be produced on a larger scale at a minimal cost; (b) an increase in economic wealth—GDP; (c) an efficiency of resource allocation; (d) R&D—competitiveness and technology spillover. The potential gains to trade openness are commonly classified into static and dynamic gains from trade as shown in the Fig. 10.1.

10.3.1 Static Gains from Trade: Ricardo's Comparative Advantage Theory

Ricardo's comparative advantage theory suggests which goods and services a country should produce and specialise in by allocating scarce resources to produce those goods and services at a lower cost. This will mean importing goods and services that are cheaper to import than produce internally. However, some analysts argue that importation of certain goods and services into a country will put its indigenous companies out of business. If the cost of producing those imported goods within a country is very high, the country will be better off importing them rather than producing them. For instance, suppose the resources that Niger uses to

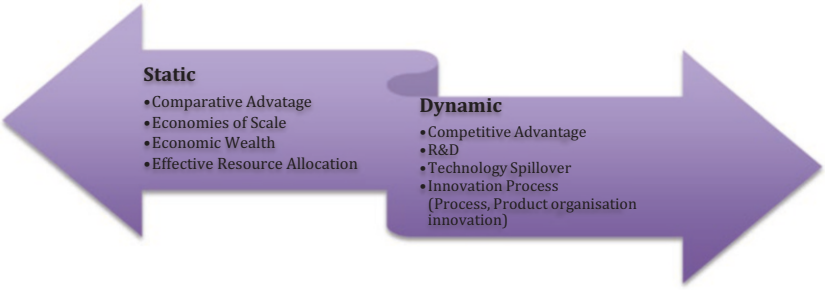

Fig. 10.1 Gains of trade. (Source: Author 2018)

refine crude oil could have produced 4057 tonnes of uranium instead, then the opportunity cost of refining crude is the 4057 tonnes of uranium. It would be cheaper for Niger to import petroleum from Nigeria and then produce uranium. This means Niger has a comparative advantage in uranium production, while Nigeria has a comparative advantage in producing petroleum.

10.3.2 Dynamic Gains from Trade

Trade openness will provide indigenous firms with the opportunity to access larger and more global markets, hence making indigenous firms more competitive and efficient in producing improved and innovative products for international markets. Research and development, technological spillover and innovations are the dynamic gains from trade openness.

Heckscher–Ohlin and Stolper–Samuelson theorems suggests that economies should specialise in the production of tradable goods and services in which they have comparative advantages, using their most abundant factor of production so that they increase their prosperity. This means that in developing countries where labour is abundant, trade openness should lead to specialisation in labour-intensive goods, whereas trade openness should lead to specialisation in capital-intensive goods in developed countries that have abundant capital. This will lead to efficient productivity and economic growth. In the nineteenth century, Alfred Marshall in 1890 agreed with Smith and Ricardo, revealing that the major determinant of economic progress of any nation was an international trade with limited restrictions. The most recent empirical analysis has also revealed that an increase in trade openness accelerates economic growth in India (Chatterji et al. 2013) and in other developing countries (Babula and Anderson 2008; Bruckner and Lederman 2012). Similarly, Allard et al. (2016) found that increased trade has a significant and positive influence on growth in sub-Saharan Africa. Both the increase in trade openness and the improvement in terms of trade have contributed to the acceleration of real per capita GDP growth. However, Allard et al. (2016) added that while trade openness is found to have supported overall growth, labour productivity itself has not benefited as much as in sub-Saharan Africa as in other regions undergoing trade.

In terms of the equitable distribution of the gains from trade openness, Dollar and Kraay (2007) revealed that (a) fairly distributed gains from trade openness can accelerate GDP per capita growth (they found no evidence to suggest that as international trade increases, inequality increases); and (b) due to the increase of GDP per capita and reduction in inequality, the incidence of poverty is reduced considerably in the selected developing countries. Similarly, Barro and Martin (1997) revealed that in the long run, trade openness can enhance economic growth in developing countries through the import of technology and knowledge. As such, developing countries with trade liberalisation policies will tend to integrate and trade more with an advanced economy in the global market and hence gain access to technology, efficiency and competitiveness. The trade liberalisation policies were introduced to an import substitution strategy when growing evidence suggested that opened economies recorded a higher economic growth rate in East Asian economies, especially in China and Hong Kong (Stiglitz 1996).

However, Gourdon (2011) found no clear-cut empirical relationship between trade liberalisation, economic growth and inequalities in developing countries. Furthermore, Olufemi (2004) argued that trade openness may have a negative impact on economic growth in countries with infant industries and in countries exporting primary products, as they become vulnerable to terms of trade shocks.

Thirlwall (2006) showed that there are several channels through which trade openness might influence the long-term economic progress of an economy. Increased trade openness: (1) attracts foreign investment and external cash flows into the host country; (2) promotes technology transfer and faster productivity growth; and (3) encourages specialisation in sectors where a country has a comparative advantage. Due to specialisation and economies of scale, more real goods and services can be traded and exchanged between countries. Open market-oriented economies can promote trade through export-led growth policies. This in turn stimulates knowledge and technology transfers, and backward and forward linkages (Kabadayi 2013). However, several factors will need to be in place to facilitate trade and attract FDI, such as macroeconomic policies, limited trade restrictions and good infrastructure (see Fig. 10.2).

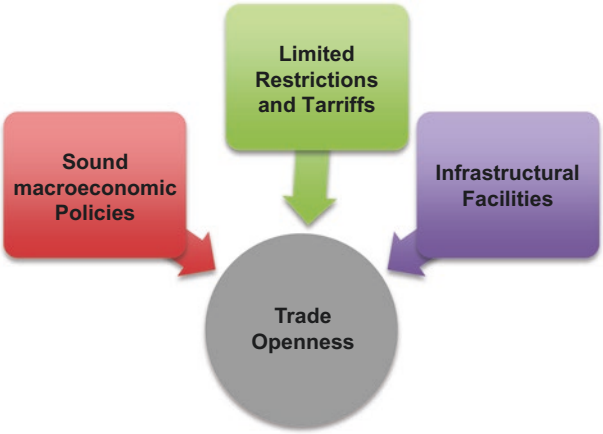

Fig. 10.2 Factors influencing trade openness. (Source: Author 2018)

Nevertheless, there are arguments that trade openness is a static trade strategy—it may work to the benefit of some countries like Taiwan, South Korea, Singapore and Hong Kong (Krueger 1997), but be detrimental to other countries. Some argue that trade openness might worsen the terms of trade ratio and balance of trade (BOP) deficit in developing countries (Le Goff and Jan Singh 2013); while others say that trade openness might encourage international dumping. Infant industries in developing countries might find it difficult to compete on international goods and services (Thirlwall 2006). White and Anderson (2001) argue that the policy reform of trade openness recommended in the Washington consensus failed to stimulate pro-poor growth in developing countries.

10.4 Trade Openness and GVCs

Through GVCs, production processes become interlinked, providing a unique opportunity for different firms from diverse countries to intensify their comparative and competitive advantages. Through the processes of making a product, which are carried out in different stages by different

enterprises in several countries (Tinta 2017), GVCs enhance economic integration and bring about the benefit of the shared value-added of goods and services from the various participants. GVCs are an important feature of international trade in almost all economies. The process begins with the production of raw materials and ends with finished products. GVCs link and co-ordinate the activities of companies at each stage of production across countries, hence enabling value creation and advancement. With the growing importance of GVCs across countries, trade openness and non-tariff barriers will help to influence interlinkages between domestic producers and foreign suppliers, creating room for inclusive growth and employment creation in most economies. This means the production of a product is no longer carried out start to finish in one place or country, but is a long series of steps and stages in a number of locations. For instance, crude oil can be produced in Nigeria in a number of stages, then transported to a different country for refining, again following a series of stages, and finally transported to a retail company for distribution and consumption.

The value chains in the oil and gas sector in terms of production and trade run through several stages. In the exploration stage, crude oil and natural resources are sought using seismic studies in the form of topographical maps, aerial photography, sound waves and 3D projections to reveal oil and gas reserves under the earth's surface. After establishing the location of oil and gas in the field, an extraction company drills for it (production). The next stage is transportation, which involves building and maintaining pipelines, and the use of large tankers and ships to transport oil and gas to refineries and customers worldwide. At the refinery stage, crude oil is transformed into petroleum products such as petrol, kerosene and diesel. The transformed products are then traded on the retail market for consumption (BP 2014; Oyejide and Adewuyi 2011). However, to make GVCs efficient it is important that firms reduce production costs and improve logistics along the production chain. Figure 10.3 shows the GVC interlinkage in the oil and gas sector in Nigeria.

To test the impact of trade openness on GVC empirically, data is sourced from the World Bank to show whether trade openness can

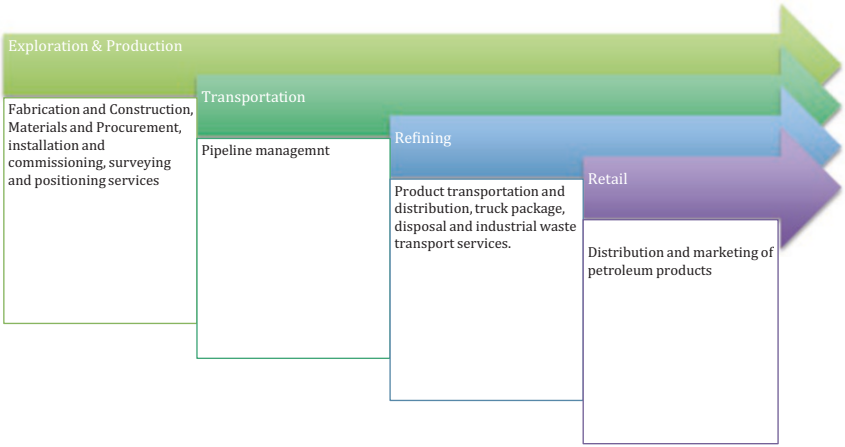

Fig. 10.3 Global value interlinkage in the oil and gas sector in Nigeria. (Source: Author 2018)

influence GVCs among countries in sub-Saharan Africa. The export value-added index is used as a proxy to measure GVCs, this proxy measure is suggested by Johnson (2017). The variables GVCs and trade openness are time series data from 1980 to 2016 sourced from World Bank National Accounts Data (2017). Based on the analysis shown in Fig. 10.4, trade openness can influence GVCs in sub-Saharan African countries. The figures show a positive relationship between trade openness and GVCs, though it is not strongly significant in most cases. This positive relationship indicates that sub-Saharan African countries will be able to increase their involvement in value chains and higher value-added activities with production and trade chains over time. Tinta (2017) found a positive relationship between trade openness and GVC. He explains that it has influenced greater integration in the value chain for ECOWAS countries, thus strengthening their position in international trade. Furthermore, Aichele and Heiland (2016) found a robust relationship between trade liberalisation and GVC in China. They say that GVCs were the driving force behind the strengthening of production networks with their trading partners, which led to significant welfare gains for China, Australia and Asian economies.

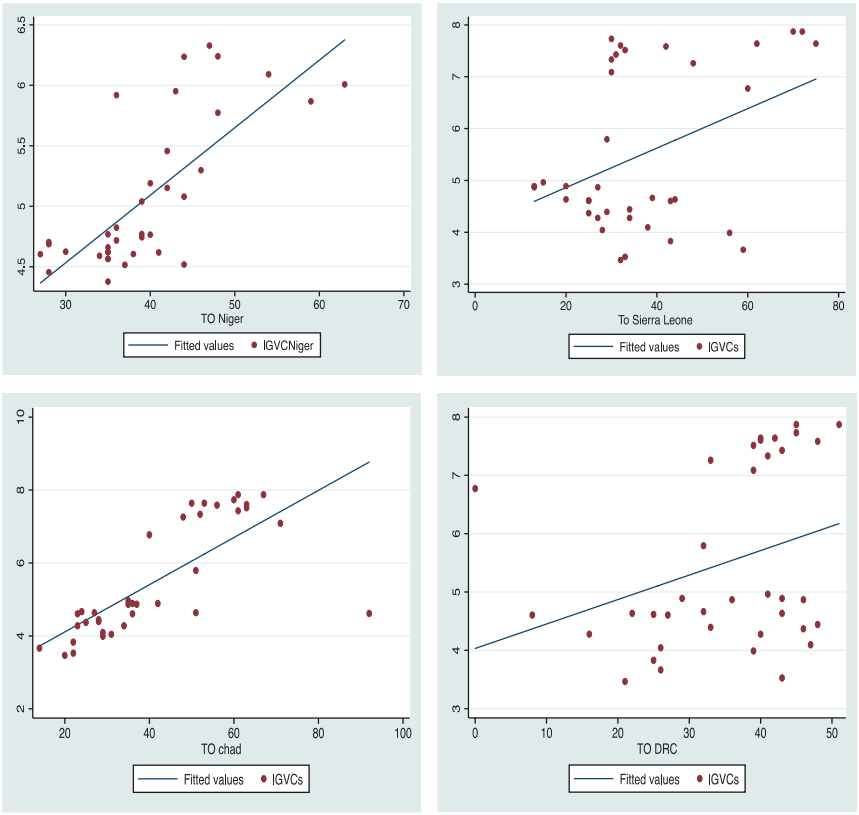

Fig. 10.4 Relationship between trade openness and GVCs in Chad, Niger, Democratic Republic of Congo and Sierra Leone. (Source: Author 2018)

10.5 Trade Openness and HDI

Trade openness has received numerous endorsements for its role in economic growth, in inequality reduction and poverty reduction. In this section, we review empirical evidence that interlinks trade openness and the HDI. Income distribution indicates how a country's total income is distributed among its population. A perfectly equal income distribution does not exist because individuals differ on the bases of skills, capabilities and education. Factors such as economic growth, economic development,

human capital, international integration and employment rate determine income distribution and standard of living.

The literature has shown that trade openness can affect overall social well-being through three channels (see conceptual framework linking trade openness to HDI below):

- revenue and income into the country—government might increase its expenditure on healthcare, education and facilities;
- income distribution due to price mechanism as a result of a competitive environment;
- firm profitability—generates employment and a potential increase in wages.

A significant body of empirical literature has established the relationship between trade openness and HDI. For instance, Fatah et al. (2012) studied the impact of life expectancy at birth, trade openness, human rights, FDI and HDI on economic growth. Their results showed that trade openness and HDI have a positive and significant effect on economic growth. Likewise, Kabadayi (2013) conducted a panel analysis to examine the effect of trade openness on the living standards of medium high-income countries between 1995 and 2010. He found a positive relationship between trade openness and HDI. Similarly, Davies and Quinlivan (2006) found a positive relationship between trade and social welfare. Moreover, Razmi and Yavari (2012) found a positive relationship between trade openness and the level of educational attainment, but revealed a negative relationship between trade openness and life expectancy. In terms of income distribution, Calderon and Chong (2001) used panel data from 1960 to 1995 and a generalised method of moments (GMM) estimation to study the relationship between trade openness and income inequality in both developed and developing countries. They found that the volume of trade was associated with changes in income distribution. But the real exchange rate and the intensity of capital controls had a negative effect on income distribution.

However, Gunduz et al. (2009) found a positive relationship between trade and social development in high-income countries, but found a neg-

ative relationship in low-income countries. Mahesh (2016) modified the work of Calderon and Chong (2001) and used GMM estimation for dynamic panel data models to test the impact of trade openness on standard of living and inequality. He found that an increase in trade volumes had in fact resulted in the worsening of income distributions and standard of living in Brazil and India. Similarly, Gourdon et al. (2008) found evidence that the effect of trade liberalisation on income distribution is conditional on the relative factor endowments of the trading partners. They used changes in tariff revenues to measure the degree of trade liberalisation and they focused on variations within countries in response to changes in trade policy. They found that trade openness increases income inequality in countries that are rich in highly skilled labour—a labour force requiring low levels of education—and capital (Fig. 10.5).

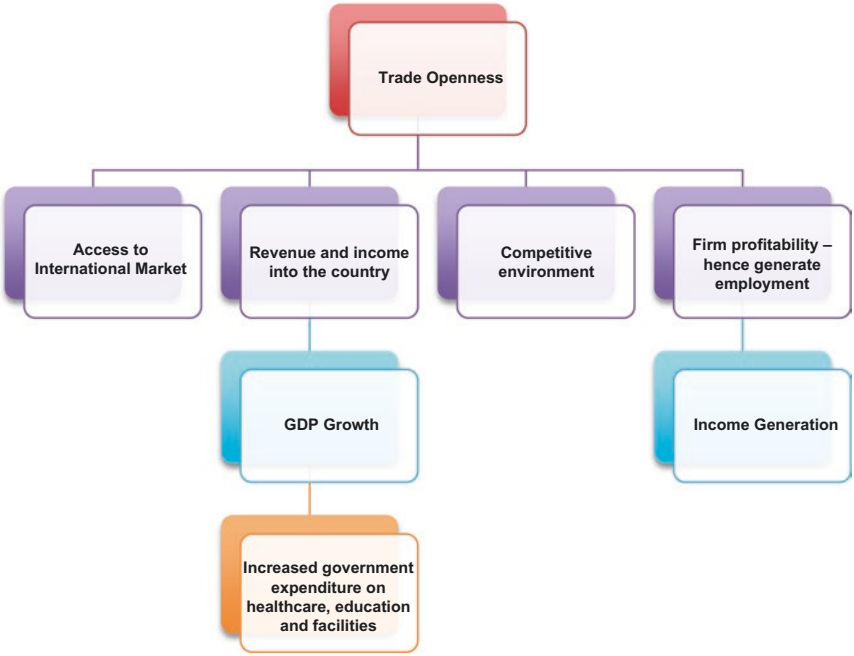

Fig. 10.5 The conceptual framework linking trade openness and human development. (Source: Author 2018; Thirlwall 2006; Razmi and Yavari 2012; Kabadayi 2013)

10.6 Data and Methodology

To measure the impact of trade openness on HDI, economic growth and GVC, a panel of data was constructed consisting of variables for Chad, Democratic Republic of Congo, Central African Republic, Niger and Sierra Leone over a 30-year period. The data has been sourced from World Bank National Accounts Data, UNESCO Institute for Statistics, UNDP and the African Development Bank because they have efficient and effective national statistical systems. This data set consists of multiple observations from five different countries *i* at different time t periods. In a linear regression, estimation bias or endogeneity bias might occur as a result of the omitted variable, a problem that arises when certain unknown variables (unobserved variables) are not included or measured in a model but are correlated or uncorrelated with the independent variables. However, with a panel model it is possible to control for some types of omitted variables even without including them or measuring them in the model by using a fixed or random effect model.

To be able to confidently eliminate omitted variable bias, it is important to understand the position of the time-variant unobserved variable μ. A fixed effect model (FEM) will be able to eliminate omitted variable bias if the time-variant unobserved variable μ has an effect on the dependent variable and is correlated with independent variable X included in the model. Similarly, the FEM will be able to eliminate omitted variable bias if the effects of the time-variant unobserved variables on the dependent variables are constant or fixed at different time t periods, that is, the effects are fixed at time 1980, 1981 and so on.

On the other hand, the random effect model (REM) in a panel of data can be used when there are no possibilities of omitted variables bias. In the real world this is impossible, as such an REM can still be used if those time-variant unobserved variables μ are uncorrelated with the independents variables X included in the model.

$$y_{it} = x_{it}\beta + \alpha + \mu_{it} + \varepsilon_{it} \tag{10.1}$$

In 10.1, y_{it} represents the dependent variable, x_{it} represents the observed or included variables in the model, α is the intercept, β is the estimated coefficient, μ_{it} is the unobserved variables and ε_{it} is the error term. For instance, in model (1) where country i = *Chad*, …Sierra Leone and time periods t are from 1980 to 2016, if the unobserved variables μ_{it} have an effect on y_{it} and are correlated with the observed variables x_{it}, the FEM will be appropriate for estimation. But if the unobserved variables μ_{it} have an effect on y_{it} and are uncorrelated with the observed variables x_{it}, the REM will be used for estimation. Nevertheless, the Hausman test will help to determine the right model to use in the panel data analysis (Table 10.1)

10.7 Models

To decide between an FEM and REM, a Hausman test was conducted to know whether the unobserved variables μ_{it} are correlated or uncorrelated with the observed variable x_{it} in the model. The Hausman test result indicates that the unobserved variables in the model μ_{it} are uncorrelated with the observed variable x_{it} (see Table 10.2) As a result REM is considered in this chapter.

Model (1)
The model is specified using the same structure as Brooks (2008) although using economic data instead. Brooks used financial variables to estimate their impact on banking growth using a REM. To investigate the impact of trade openness on HDI and real GDP growth while simultaneously controlling for other factors in the panel data, an REM is used in 10.2 and 10.5.

$$logHDI_{it} = a + \beta_1 logTO_{it} + \beta_2 logrGDP_{it} + \beta_3 ED_{it} + \left(\mu_i + \varepsilon_{it}\right) \quad (10.2)$$

Where the HDI is the dependent variable, it measures the human development achievements of a country in terms of health and standard

Table 10.1 Definition of variables and expected regression signs

Variables	Expected impact of variables on real GDP	Expected impact of variables on HDI	Definition of the variable	Justification	Data type	Source of data
TO_{it} Trade openness	(+) Increase in trade openness should influence real GDP growth	(+) Increase in trade openness should influence HDI increase	The sum of exports and imports of goods and services— measured as a share of GDP (gross domestic product)	Fatah et al. (2012), Dollar and Kraay 2007, Gourdon (2011)	Continuous	World Bank National Accounts Data (2017)
$log\ GVCs_{it}$	Dependent variable in model (3)	Dependent variable in model (3)	To measure GVCs, export value added index is used as a proxy for each country	Johnson (2017)	Continuous	World Bank National Accounts Data (2018)
ED_{it} Education	–	(+) Increase in educational level should influence HDI growth	Percentage of primary completion rate regardless of age	Razmi and Yavari (2012)	Continuous	UNESCO Institute for Statistics (2017)
$rGDP\hat{}_{it}$ Real GDP growth	Dependent variable in model (2)	(+) Increase in real GDP level should influence HDI growth	Annual percentage growth rate of GDP at market prices based on constant local currency	Dollar and Kraay (2007), Thirlwall (2006)	Continuous	World Bank National Accounts Data (2017)
$logK_{it}$ Capital accumulation	(+) As capital formation/ accumulation increases, real GDP increases	–	Proxy for measuring capital stock	Keho (2017)	Continuous	World Bank National Accounts Data (2017)
$logL_{it}$ Labour force	(+) As labour force increases, real GDP increases	–	People aged 15 and older who supply labour for the production of goods and services	Keho (2017	Continuous	World Bank National Accounts Data (2017)

(*continued*)

Table 10.1 (continued)

Variables	Expected impact of variables on real GDP	Expected impact of variables on HDI	Definition of the variable	Justification	Data type	Source of data
Country dummies (interaction with trade openness)		(+/–)	Sub-Saharan African countries with the lowest HDI	–	Dummy variable	–
HDI	–	Dependent variable in model (1)	Measures the human development achievements of a country in terms of health, and standard of living	Fatah et al. (2012), Kabadayi (2013), Davies and Quinlivan (2006), Razmi and Yavari (2012), Gunduz, Hisarciklilar and Kaya (2009)	Continuous	UNDP (2017)

Author (2018)
Fatah et al (2012) showed that trade openness and HDI have a positive and significant effect on economic growth
(Dollar and Kraay 2007) showed that fairly distributed gains from trade openness can accelerate GDP per capita growth
Gourdon (2011) found no clear-cut empirical relationship between trade liberalization, economic growth and inequalities in developing countries
Razmi and Yavari (2012) found a positive relationship between trade openness and level of educational attainment but revealed a negative relationship between trade openness and life expectancy
Johnson (2017) suggest that export value-added index be used as a proxy to measure global value chains, he finds this proxy as an appropriate measure
Razmi and Yavari (2012) found a positive relationship between trade openness and educational attainment
Thirlwall (2006) supports the argument that trade surplus brought about economic progress
Keho (2017) found a long run relationship between economic growth and capital accumulation
Kabadayi (2013) found a positive relationship between trade openness and human development index
Davies and Quinlivan (2006) found a positive relationship between trade and social welfare
Gunduz, Hisarciklilar and Kaya (2009) found a positive relationship between trade and social development in high-income countries but found a low and negative relationship in low-income countries

Table 10.2 Hausman test for model (1) (HDI)

Test: Ho: difference in coefficients not systematic
Chi2 (3) = (b-B)'[(V_b-V_B)^(−1)](b-B)
= 6.05
Prob>chi2 = 0.1093
(V_b-V_B is not positive definite)

Author (2018)

of living. Trade openness (TO) is the sum of exports and imports of goods and services measured as a share of GDP, ED_{it} is the percentage of primary completion rate regardless of age and sex, μ is the observed variables, ε is the stochastic error term, a is the intercept, $\beta_{1\ldots n}$ are the parameters, i is the country vector and t is the time period.

Model (2)

To test the impact of trade openness on economic growth, we specified our model using the Cobb–Douglas production function by combining capital and labour.

$$Q_{it} = T_{it} + K_{it} + L_{it} \tag{10.3}$$

Where Q_t represents the real economic output of each country at a particular time, K_{it} represents the capital stock of each country; L_{it} is labour force of each country at time t and T_{it} represent technological progress. In this model, the Cobb–Douglas production function is extended by assuming that technological progress is the function of trade openness.

$$T_{it} = TO_{it} + \mu_{it} \tag{10.4}$$

Here, T_{it} represents technological progress, TO_{it} represents trade openness and μ_{it} represents unobserved factors that are also functions of technological progress. Using a substitution technique, (10.3) and (10.4) are used to develop a growth model for panel data analysis in (10.5).

$$rGDP\hat{}_{it} = \alpha + \beta_1 TO_{it} + \beta_2 logK_{it} + \beta_3 logL_{it} + +\left(\mu_i + \varepsilon_{it}\right) \tag{10.5}$$

Here, *rGDP^* represents real GDP growth, TO_{it} represents trade openness, $logK_{it}$ represents capital stock, L_{it} represents labour force, μ represents the observed variables, ε is the stochastic error term, a is the intercept, $\beta_{1\ldots n}$ are the parameters, i is the country vector and t represents the different time periods.

Model (3)

To measure the impact of trade openness on GVCs, the variable export value-added index is used as a proxy to measure GVCs as suggested by Johnson (2017). The variable is sourced from World Bank National Accounts Data (2017). The data are time series data from 1980 to 2016. A model similar to Aichele and Heiland (2016) is adopted. They derived a model for value-added trade flows based on the methodology developed by Johnson and Noguera (2012). The export values index is the current value of export converted to US dollars and expressed as a percentage of the average for the base period 2000. OLS regression is used to run the model to determine the impact of trade openness on GVCs at individual country level. The following regressions are used:

$$logGVCs\_Chad_t = \beta_0 + \beta_1 TO\_Chad_t + rGDP\hat{}_t + \varepsilon_t \tag{10.6}$$

$$logGVCs\_CAR_t = \beta_0 + \beta_1 TO\_CAR_t + rGDP\hat{}_t + \varepsilon_t \tag{10.7}$$

$$logGVCs\_DRC_t = \beta_0 + \beta_1 TO\_DRC_t + rGDP\hat{}_t + \varepsilon_t \tag{10.8}$$

$$logGVCs\_Niger_t = \beta_0 + \beta_1 TO\_Niger_t + rGDP\hat{}_t + \varepsilon_t \tag{10.9}$$

$$logGVCs\_Sierra\ Leone_t = \beta_0 + \beta_1 TO\_Sierra\ Leone_t + rGDP\hat{}_t + \varepsilon_t \tag{10.10}$$

In 10.6, 10.7, 10.8, 10.9, and 10.10, $logGVCs_t$ represents the variable GVCs for the five respective sub-Saharan African countries included in the analysis, TO_t represents trade openness and *rGDP^* represents real GDP growth, t represents the 37-year time period from 1980 to 2016

variables, ε is the stochastic error term, β_0 is the intercept and $\beta_{1\ldots n}$ represents the parameters. The OLS estimator is a method of estimating parameters $\beta_1 \ldots \beta_n$ in a linear regression model.

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots. + \beta_n x_n \tag{10.11}$$

OLS minimises the sum of the squared residuals (SSR). It calculates the slope coefficients so that the difference between the predicted Y and the actual Y is minimised (Wooldridge 2009, pp. 73).

$$\text{SSR} = \sum_{i=1}^{n} \left(y_i - \hat{\beta}_0 - \hat{\beta}_1 x_{i1} - \hat{\beta}_2 x_{i2} - \ldots. - \hat{\beta}_n x_{in} \right)^2 \tag{10.12}$$

Here, subscript i denotes the observation number, n denotes the number of observations and $X_{i1} \ldots$n denotes the independent country variable. OLS seeks to estimate the parameters β_0, β_1, β_2, $\beta_3 \ldots \beta_n$ in the following equation:

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + \ldots. + \hat{\beta}_n x_n \tag{10.13}$$

The minimisation of residual by OLS is done through multi-variable calculus (Wooldridge 2009, pp. 74), hence leading to $n + 1$ linear equations in $n + 1$ unknowns $\hat{\beta}_0, \hat{\beta}_1, \hat{\beta}_2, \hat{\beta}_3 \ldots \hat{\beta}_{n.}$[1]

10.8 Empirical Analysis and Results

In this chapter, the empirical analysis is sub-divided into the analyses for model (1), model (2) and model (3). In the analysis for model (1), the REM is used to analyse the impact of trade openness on HDI. In the analysis for model (2), both the REM and OLS model are used to examine the impact of trade openness on real GDP growth rate, and finally, to analyse model (3), the OLS model is used to estimate the impact of trade openness on GVCs.

10.9 Results for Model 1 (HDI)

To decide between the FEM and the REM, the Hausman test was run to find whether the unobserved variables μ_{it} are correlated or uncorrelated with the observed variables x_{it} in model (1). The Hausman test result indicates that since the p value is greater than 0.05, the FEM is not consistent but the REM is more consistent and appropriate to estimate model (1). Random effect estimation will not be biased as a result of endogeneity since unobserved variables are uncorrelated with the error term. As such, the need for IV estimation will not be necessary.

But how consistent and appropriate is the random effect estimator? Is OLS regression a preferred option since μ_{it} is uncorrelated with x_{it}? To answer this question and ascertain whether RE is the most appropriate estimate for model (1), the Breusch and Pagan Lagrangian multiplier test for random effects is employed. This test indicates the use of either a random effect regression or a simple OLS regression (Table 10.3).

The null hypothesis for Breusch and Pagan Lagrange multiplier test is that variance across countries is equal to zero and if so, OLS is the best estimation of model (1), that is:

H0: Var (u) = 0,

H1: Var (u) ≠ 0.

Based on the result in Table 10.3, the variance across countries is not equal to zero because the p value is less than 0.05, therefore we reject the null hypothesis and accept the alternative hypothesis and thus conclude that random effect regression is indeed the right estimation for model (1) (Table 10.4).

Table 10.3 Breusch and Pagan Lagrangian multiplier test for random effects

Estimated results	Var	sd = sqrt (Var)
Log HDI	0.0448205	0.2117085
E	0.0185305	0.1361268
U	0.0013375	0.0365713
Test: Var (u) = 0 Chibar2 (01) = 11.07 Prob > chibar2 = 0.0004		

Author (2018)

Table 10.4 Random effect regression for model (1) (HDI)

HDI	Random effect	p values
TO_{it}	0.0946	0.094
	(1.68)	
$rGDP\hat{}_{it}$	0.0235	0.159
	(1.41)	
ED_{it}	0.301***	0.000
	(9.74)	
_Cons	−2.738***	0.000
	(−17.81)	
Overall R2	0.5479	–
Between R2	0.6607	–
No of observations	128	–

Statistics in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (Author 2018)

Based on the results of random effect regression in Table 10.4, trade openness (TO_{it}) has no significant impact on HDI. This result is not surprising. Sub-Saharan African countries have not been able to utilise the gains of trade to boost human and economic development. They have not been able to create a systematic linkage between trade openness and HDI, such as having (a) a strong government institution, (b) strong trade policies and procedure of implementing and monitoring those policies and (c) strong policies on inequality—how to distribute the gains from trade fairly. The findings are consistent with the work of Gunduz et al. (2009): they found no significant relationship between trade openness and HDI in low-income countries.

The variable real GDP growth ($rGDP\hat{}_{it}$) has been included in the model to capture its effect on HDI. Growth in real GDP is expected to influence HDI, however, the result indicates otherwise; real GDP growth shows no significant impact on HDI. This means that economic growth is not reflected in countries' standards of living and growth is not properly managed. The growth is not channelled into providing public services to improve living standards. According to Friedman (2006), if economic growth is not properly distributed, its impact on standard of living will not be significant.

However, the education variable (ED_{it}) has shown a positive and significant impact on HDI. The result shows that an increase in education

increases HDI by 30%. The literature emphasises that acquiring a good education is an effective way of improving quality of life.

10.10 Results for Model 2 (Real GDP Growth)

For model (2), again a Hausman test was used to decide between FEM and REM. The Hausman test results in Table 10.5 indicate that random effect is more consistent and appropriate than a fixed effect for estimating model (2).

A Breusch and Pagan Lagrangian multiplier test was carried out to decide between using an OLS or REM. Based on the results in Table 10.6, the variance across countries is equal to zero because the p value is greater than 0.05, which means that OLS can be used to estimate model (2).

Both the pooled OLS and random effect estimation show that trade openness (TO_{it}) has a significant and positive impact on economic growth—that is, a 1% increase in trade openness will increase economic growth by 0.158. This finding is in line with the work of Barro and Martin (1997); Dollar and Kraay (2007); Babula and Anderson (2008);

Table 10.5 Hausman test for model (2) (real GDP growth)

Test: Ho: difference in coefficients not systematic Chi2 (3) = (b-B)'[(V_b-V_B)^(−1)](b-B) = 0.88 Prob>chi2 = 0.8298 (V_b-V_B is not positive definite)

Author (2018)

Table 10.6 Breusch and Pagan Lagrangian multiplier test for random effects

Estimated results	Var	sd = sqrt (Var)
$rGDP\hat{}_{it}$	62.81454	7.925562
E	49.6869	7.048894
u	0	0
Test: Var (u) = 0 Chibar2 (01) = 0.00 Prob > chibar2 = 1.0000		

Author (2018)

Bruckner and Lederman (2012); and Chatterji et al. (2013) who support the argument that trade openness can accelerate GDP growth. Barro and Martin (1997) further highlight that trade openness will enhance economic growth in the long run through the creation of access to international markets and importation of technology and knowledge into home countries.

Besides the trade openness variable, the regression included other potential determinants of economic growth (capital accumulation, and labour force) based on the Cobb–Douglas production function. From the pooled OLS and RE results in Table 10.7, we find capital accumulation ($logK_{it}$) is associated with economic growth. It has a positive and significant impact on economic growth: a 1% increase in a country's capital accumulation will increase economic growth by 0.619. The results are consistent with the work of (Keho 2017) who found a long-term relationship between economic growth and capital accumulation.

However, the variables of labour force and education did not show any significant relationship to economic growth. Research conducted by the International Institute for Applied Systems Analysis showed that countries with low levels of education tend to have a slow rate of economic growth.

Table 10.7 Results for model 2 (real GDP growth)

Real GDP growth	Random effect	Pooled OLS with robust standard error
TO_{it}	0.158***	0.158**
	(0.000)	(0.004)
$logK_{it}$	0.619***	0.619***
	(0.000)	(0.000)
$logL_{it}$	0.146	0.146
	(0.843)	(0.827)
ED_{it}	−0.0139	−0.0139
	(0.646)	(0.739)
_Cons	−20.17	−20.17*
	(−0.091)	(0.042)
R2	–	0.2431
Overall R2	0.2431	–
Between R2	0.2063	–
Number of observations	133	133

p values in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (Author 2018)

10.11 Results for Model 3 (GVCs)

To investigate the impact of trade openness on GVCs while simultaneously controlling for other factors, pooled OLS regression is used. It was assessed whether trade openness has a significant impact on GVCs on an individual country level and whether the influence of trade openness will differ systematically when an additional explanatory variable is included in the model.

In an unreported simple regression, the results show that GVCs have a robust and significant relationship to trade openness on an individual country level. Even after controlling for real GDP variables, the relationship still holds. The pooled ordinary least squares (OLS) results (column (1) in Table 10.8) indicate that the impact of trade openness is associated with positive GVC activities in Chad, Niger and Sierra Leone. However, the impact of trade openness on GVC is rather weak in Central African Republic (CAR) and the Democratic Republic of Congo.

Trade openness has influenced the emergence of GVCs together with technological progress, transportation, communication and policy reforms in support of trade. Production processes have spread among countries encouraging supply chains in which value is added at each stage before crossing the border to be passed on to the next stage. Trade openness and GVCs in Chad, Niger and Sierra Leone have allowed countries to better exploit their comparative advantages, by giving them the opportunity to

Table 10.8 Results for model 3 (GVCs)

GVCs	Pooled OLS coefficients with robust standard error	R^2	C^
$TO - chad_t$	0.0647**	0.5488	2.816***
	(0.002)		
$TO - CAR_t$	0.0138	0.0488	4.005***
	(0.058)		
$TO - DRC_t$	0.0205	0.1520	4.909***
	(0.138)		
$TO - Niger_t$	0.0558***	0.5372	2.859***
	(0.000)		
$TO - Sierra\ Leone_t$	9.981**	0.6861	−40.844*
	(0.002)		
Number of observations	37	37	37

p value in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (Author 2017)

join a production chain. Chad has oil, cattle, cotton, gum Arabic and a large pool of labour. This provides an excellent opportunity to the country to specialise in the production of cattle, cotton and gum Arabic, hence generating a portion of value-added goods. This means that a share of the value-added of exports is captured locally. Knowledge transfers from other producers in the value chain can support productivity and income growth (Allard et al. 2016). Sub-Saharan countries such as Niger and Sierra Leone have made progress in integrating value chains where uranium ore, diamonds, rutile, cocoa, coffee, livestock, cowpeas and onions are the commodities playing a major role. They further added that Democratic Republic of Congo and other oil exporters in sub-Saharan African countries are the least integrated into GVCs, suggesting that diversification of trade away from natural resources has stagnated if not gone backwards over the past 20 years. To improve the impact of trade openness on GVC in Central African Republic and Democratic Republic of Congo, and to take advantage of their comparative advantages, these countries need to create policies to improve their business environment, infrastructure (energy, good transportation and communication links), improve political transparency and uphold their rules of law. For GVCs to be more effective, the manufacturing sector and industries need to be revived because they are the most vital sector for stimulating economic growth, productivity and value chains.

10.12 Conclusion and Policy Implications

In this chapter, the role of trade openness on HDI, economic growth and GVCs in five sub-Saharan African countries with the lowest HDI was examined using unbalanced panel data from 1980 to 2016. The Hausman test determined the best estimate for analysing panel data and indicated that the unobserved variables in the test models μ_{it} are uncorrelated with the observed variables x_{it} and so random effect and pooled OLS were the right estimations for the analyses. The results showed that trade openness was not significant in explaining HDI but was significant in explaining economic growth and GVCs. This implies that trade openness as a concept is very important in accelerating economic growth and creating GVCs, and has impacted positively in increasing real GDP growth by almost 15% in

the selected sub-Saharan African countries. Books on trade openness have shown that rapid growth and generally better macroeconomic performance in emerging countries leads to growing trade flows. Better political stability, improved macroeconomic management and access to financing as well as an improved business environment have supported investment efforts, which in turn improved the productive capacity in emerging countries.

However, the gains from trade openness have not been fairly distributed among the citizens in Africa, which is why the variable is showing no significant impact on HDI. Mahesh (2016) suggests that trade openness does not reflect on the standard of living because the increased volume of trade may only benefit a small percentage of the population, as most sub-Saharan African countries are more labour intensive and not capital intensive (gains from trade are more easily distributed in capital-intensive countries than in labour-intensive countries). Moreover, countries that are abundant in unskilled and less educated labour may experience a worsening of the income distribution than countries that have a skilled and educated labour force.

As such, a strong inclusion action plan will be required by African governments to increase expenditure on:

- healthcare—to improve life expectancy;
- innovation and technology;
- education—to increase the skilled and educated labour force and to increase average years of schooling for adults; and
- social facilities—to increase standard of living.

The variable of education shows a significant impact on HDI. According the findings in Table 10.4, acquiring further education has increased HDI in Africa by 30%. However, the education variable does not have a significant impact on real GDP growth. Literature has emphasised the role of education in acquiring skills and knowledge that can be used for the production of goods and services to accelerate growth and productivity. The implication is that more investment is required in the area of education to boost skills and productivity in Africa.

Since trade openness has shown to be significant in accelerating real GDP growth and GVC in the few selected sub-Saharan African countries,

it is important that infrastructure systems are developed in Africa. Infrastructure appears to be the most significant obstacle to trade in sub-Saharan African countries. According to Allard et al. (2016), taking infrastructure to the average level of quality at the international level would help improve sub-Saharan African trade by as much as 42%, as this would substantially lower the cost of cross-border movements of goods and services. Aside from infrastructure, governance and a favourable business environment would also have a very positive effect in increasing trade in sub-Saharan African countries. According to Allard et al. (2016), growing the index of rule of law to the global average level would cause a 28% increase in sub-Saharan African trade flows. Actions to lower non-tariff obstacles to trade (export taxes and duties), eliminate corruption, reduce delays in clearing customs and reduce extra trade costs would greatly improve prospects for trade, especially at the regional block level. Lowering tariffs in sub-Saharan African would encourage the development of both international and regional trade. On average, bringing tariffs to the average global level could yield about 14% in foreign trade.

Furthermore, access to credit for businesses plays a significant role in accelerating trade. Allard et al. (2016) further added that financial deepening to the level observed elsewhere in the world would support an expansion of trade of as much as 29%. However, they added that financial deepening would need to be accompanied by adequate macroprudential frameworks to carefully manage the corresponding risks.

Notes

1. This is the act of differentiation, integration and vector calculus for functions involving more than one variable (multiple variables).

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[1] Note: Page numbers followed by 'n' refer to notes.

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